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GOVERNMENT NOTICES

SOUTH AFRICAN QUALIFCATIONS AUTHORITY

No. 721 17 August 2007

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Chemical Industries

registered by Organising Field 06 - Manufacturing, Engineering and Technology, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saga.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and no *later than* 17 *September 2007.* All correspondence should be marked Standards Setting - Chemical Industries and addressed to

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SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Certificate: Household and Personal Care Products Manufacturing Processes

SAQA QUALID	*QUALIFICATION TITLE*		
58976	National Certificate: Household and Personal Care Products Manufacturing Processes		
ORIGINATOR		*PROVIDER*	
Chemical Industries 5GB			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
National Certificate	6 - Manufacturing, Engineering and Technology	Manufacturing and Assembly	
ABET BAND	*MINIMUM CREDITS*	*NQF LEVEL*	*QUAL CLASS*
Undefined	120	Level 3	Regular-Unit Stds Based

PURPOSE OF THE QUALIFICATION
Purpose:

The purpose of this qualification is to provide the learner with the standards and the range of learning required for the making of household and personal care products, including cosmetics. The qualification is also suited to workplaces that blend oils for lubrication, vehicle maintenance and allied purposes, or manufacture products found in domestic and light commercial environments, including pesticides, fertilizers, and a number of other chemical or chemically related products.

The manufacturing process will be semi-automated, automated, or pressurized, and the products will be in the form of liquids, creams, pastes, waxes, gels, emulsions, blended petroleum products, and/or aerosols.

The qualification provides the flexibility to articulate to other manufacturing activities within the Chemical industries, for example, soap, detergent or surface coatings. It will also be of use in the Speciality Chemicals sub-sector, and other manufacturing and Packaging environments, for example, the Food and Beverage Sector.

Rationale:

Chemical product manufacturing is a core function of the chemical industries; however, operators working in this area were in the past instructed informally, on the job. Such instruction resulted in an acceptable level of product quality in the past, but the rising competitiveness of the manufacturing industries in India and China, amongst other countries, means that South Africa must identify, and document best practices, and ensure that workers are sufficiently skilled to deliver high quality, low cost products to an increasingly discerning market.

This qualification aims to maximise the skills of a chemical operator by ensuring that the learner manufactures chemicals to specification and solves chemically related problems occurring during manufacturing. He/she will also learn to optimise quality and workplace productivity, perform basic maintenance; operate effectively within the framework of safety legislation, and co-ordinate people and activities in his/her area.

Whilst preparing the learner for a formal career in a manufacturing plant, the qualification also acknowledges the national drive towards job creation, and embraces the concept of entrepreneurship. To this end, the operator will be given an appreciation of the principles of business and the factors that impact on productivity.

The qualification provides the basis for further learning in quality assurance, production, supervision, technical support and productivity. Following the declaration of competence against this qualification, learners will be in a position to engage more directly in controlling and troubleshooting the production processes. Furthermore, exposure to the basics of business will assist the learner to understand, and consider starting up, a small manufacturing business.

RECOGNIZE PREVIOUS LEARNING?
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LEARNING ASSUMED IN PLACE
It is assumed that learners are already competent in Communication and Mathematical Literacy at NQF Level 2.

Recognition of Prior Learning:

This qualification recognizes the experience and expertise of operators who do not have formal qualifications aligned to this qualification. RPL assessment may be conducted for parts or all of this qualification, and should be based on ETQA's RPL policy and guidelines.

Access to the Qualification:

Access to this qualification is open. However, it is preferable that learners have completed the National Certificate in Chemical Manufacturing Operations: NQF Level 2.

QUALIFICATION RULES
• All the fundamental unit standards, totalling 36 credits, are compulsory.
• All the core unit standards, totalling 56 credits, are compulsory.
• There are three manufacturing process specializations in the elective component. All learners must complete one of the following unit standards, depending on the chemical process in their specific area of work:
o "Produce chemical products using automated batching systems" - 15 credits or;
- > "Operate equipment" - 10 credits or;
o "Fill pressurized containers to produce aerosols" - 8 credits.
• Further credits must be selected from the elective components of the qualification so that the learner completes a minimum of 120 credits to achieve the qualification.

EXIT LEVEL OUTCOMES
1. Produce household, personal care and/or related products.

2. Maintain health, safety and quality assurance practices in a manufacturing environment.

3. Demonstrate an understanding of basic economic and business principles.

4. Communicate orally and in writing in order to co-ordinate the activities of people and production.

ASSOCIATED ASSESSMENT CRITERIA
Associated Assessment Criteria for Exit Level Outcome 1:

• Household, personal care and/or related products are manufactured to specification, and within the timeframes recognized as good practice.

• Problems encountered during the manufacturing process are identified and resolved, using process chemistry and related technology.
• Routine maintenance is performed on plant machinery, as per maintenance schedules.

Associated Assessment Criteria for Exit Level Outcome 2:

• The importance and interactive role of safety with regards to employer, employee and the State is understood, and safe practices are applied.
• The quality assurance system and quality objectives, standards and elements are explained and discussed, as they relate to the manufacture of household and personal care products.
• Personal hygiene and health is maintained at all times.

Associated Assessment Criteria for Exit Level Outcome 3:

• Allocated resources are used in a cost-effective way with a view to improving profitability.
• Explanations are made on how individual actions can impact on profit and loss, and cash flow.
• Supply and demand of goods and services are identified and discussed with regard to consumer behaviour and factors of production.

Associated Assessment Criteria for Exit Level Outcome 4:

• Team performance is enhanced with the use of plans and methodologies.
• Differences of opinion are mediated in a manner that reduces conflict and focuses on the task at hand.
• Oral communication is clear and suitable for different workplace audiences at all times.
• Written communication is clear and to the point, and meets organizational requirements.

Integrated Assessment:

For formative and summative assessment, the Assessor should look for opportunities to maximise integration of the various outcomes in the qualification. The final assessment must be based on a summative assessment guide. Such a guide needs to indicate how the assessor will assess different aspects of the performance and will include:

• Observing (and listening to) the learner at work.
• Asking questions and initiating short discussions to test understanding.
• Looking at records, reports, logbooks, handover books, and other relevant workplace documentation.
• Using simulation, where this is appropriate.
• Speaking to and obtaining written evidence of competence from supervisors and managers.

The learner may choose in which language *s/he* wants to be assessed. This should be established as part of a process of preparing the learner for assessment and familiarising the learner with the approach being taken.

The assessment process should cover the explicit tasks required for the qualification as well as the understanding of the concepts and principles that underpin the activities needed in order to manufacture household and personal care products, solve operating problems, understand safety legislation and quality principles, apply basic business and economic principles, and lead and co-ordinate people and activities.

Assessors need to ensure that the 12 principles of assessment have been met, and this includes the evaluation of evidence to verify that the learner has been performing consistently over a period oftime.

INTERNATIONAL COMPARABILITY

Benchmarking took into account the following:

• Countries that have a Qualifications Framework, such as the United Kingdom (NVQ and SVQ), Australia and New Zealand.
• Countries which are reputed to be leaders in manufacturing, such as countries of the European Community, the United States of America and Canada.
• SADEC countries, which are in geographical proximity to South Africa.
• Countries which have shown significant progress in their manufacturing practices in the last five years, such as India, China and Malaysia.

/n each of the countries considered, special attention was paid to Best Practices.

The United Kingdom:

The Department of Trade and Industry says that chemical manufacturing has become a cornerstone of the UK's national economy, is the building blocks for many other manufacturing industries and one of the top wealth creators for Britain. It has one of the highest growth rates in comparison with other manufacturing industries. As in South Africa, the United Kingdom says that 88% of employers report skills gaps because of new working practices, use of new technology, stricter regulation, and the need for increased productivity.

UK Qualifications that can be compared to the proposed National Certificate in Chemical Manufacturing Operations are:

• Process Operations (Chemical and Pharmaceutical) Levels 1 (10 Q1016461) Level 2 (10 Q1019729) and Level 3 (10 Q1016463).
• Performing manufacturing Operations Level 1 (/0 Q1025204) and Level 2 (101025205).
• Process manufacture (Chemicals) Level 2 (Q1026616) and Level 3 (Q1026617).

Each of the abovementioned qualifications focuses on process technology, and the theory and practice of manufacturing. There is also emphasis on working in teams, and on using hand tools to perform basic maintenance and changeovers on production machinery.

European Community:

Although the European Community generally includes a Vocational component to qualifications design, nothing has yet been agreed with regards to individual qualifications. The research did not yield similar qualifications except for France's Vocational Baccalaureat, where learners have an option to elect process operations.

Australia:

The Australian Qualifications Framework has registered qualifications for the Chemical Plant Labourer, which may be compared to the National Certificates in Chemical Manufacturing at Levels 2 and 3 of the NQF.

These qualifications include:

• Certificate 1 in Process Plant Skills (Australia -ID PMA10102).
• Certificates II and III in Process Plant Operations (Australia - 10 PMA 20102 and 30102).

The AQF qualifications move from a generic application of skills for the Chemical, oil and allied industry at Level 1, and lead to a number of strands, one of which covers chemical manufacturing as described in this qualification. Units have a strong emphasis on (a) safety, health and environment; and (b) people and change management. There is some business-related learning in the qualifications.

The Competitive Manufacturing Initiative (CMI) is an Australian initiative that looks at enhancing Australian competitiveness. The CMI has registered two certificates (Levels iii and iv) a Diploma (Level V) and an Advanced Diploma (Level VI) in competitive manufacturing practices that range from Six Sigma, advanced process control, advanced problem solving and maintenance techniques, and change management. These CMI initiatives go beyond the proposed qualification.

New Zealand:

A number of uriit standards were found on the NZQA related to Packaging in food and reiated (including chemically-related FMCG) at Level 3. The unit standards have not been grouped into qualifications, but are significantly similar to the Core unit standards used in this qualification.

The United States of America:

The Manufacturing Skills Standards Council (MSSC) has researched and presented a set of manufacturing skills with descriptors and performance indicators. These skills may be selected according to needs, and appear to reflect best practice in manufacturing. The proposed qualification may be favourably compared to the list of Manufacturing skills listed by the MSSC.

Canada:

The Canadian Chemical Producers' Association claims to represent 90% of the 200 chemical plants in that country. However, the Association does not advertise any courses related to the production of chemicals.

India:

All research conducted on Indian qualification point to the existing City and Guilds qualifications that are linked to the National Vocational Qualifications system, and designed by VSET (see United Kingdom above).

Malaysia and China:

There is no evidence of a similar qualification.

The African continent and SADC countries:

Various countries in the SADC region are in the process of implementing their Qualifications Framework, Namibia, Botswana, Mauritius, Swaziland and Zimbabwe having done some work. The Botswana Training Authority recognizes technical training under the field "Engineering, Manufacturing and Technology" but no qualifications similar to this proposed qualification was identified.

Conclusion:

The National Certificate in Household and Personal Care Manufacturing Operations, NQF Level 3, is unique because it is targeted specifically at learners who work in a Fast Moving Consumer Goods environment. However, the qualification is sufficiently similar to unit standards and/or qualifications that have been generated in the United Kingdom, Australia and New Zealand. The competencies addressed in the qualifications are both nationally relevant and internationally comparable.

ARTICULATION OPTIONS

Horizontal articulation is possible with the following NQF Level 3 qualifications:

• 1057879: National Certificate: Manufacturing of Surface Coatings, NQF Level 3.
• 105694: National Certificate in Packaging Operations, NQF Level 3 .

Vertical articulation is possible with the following NQF Level 4 qualifications:

• Further Education Training Certificate: Supervisory Management.
• Further Education Training Certificate: Laboratory Practice.

MODERATION OPTIONS

• Anyone assessing a learner or moderating the assessment of a leamer against this qualification must be registered as a Constituent Assessor with the appropriate ETQA.

• Any institution offering learning that will enable the achievement of this qualification must be accredited as a provider with, or have their programme approved by the relevant ETQA.

• Assessment and moderation of assessment will be overseen by the relevant ETQA according to the ETQA's policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQAs (including professional bodies); and in terms of the moderation guideline detailed immediately below.

• Moderation must include both internal and external moderation of assessment, and should encompass achievement of the competence described in individual unit standards and exit level outcomes, as well as the integrated competence described in the qualification.

• Anyone wishing to be assessed against this qualification may apply to be assessed by any assesstnent agency, assessor or provider institution that is accredited by the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

For an applicant to register as an assessor, the applicant needs:

• To be registered as an assessor with the relevant ETQA.
• To have a similar qualification at one level higher than the level of the qualification and a minimum of 1 year relevant experience.

NOTES

N/A

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	13998	Demonstrate an understanding of the principles Of supply and demand, and the concept: production	Level 1	2
Core	244071	Apply samollnq theory and practice	Level 2	5
Core	13221	Perform routine maintenance	Level 2	8
Core	8000	Apply basic business principles	Level 3	9
Core	13234	Apply quality procedures	Level 3	8
Core	246509	Demonstrate understanding of good health, safety, hygiene and environmental practices in a manUfacturing environment	Level 3	8
Core	14801	Solve operating problems using process chemistry and related technology	Level 3	10
Core	242821	Identify responsibilities of a team leader in ensuring that oraanisational standards are met	Level 4	6
Elective	120410	Clean and sanitise food manUfacturing equipment and surfaces manually	Level 1	4
Elective	120405	Clean and sanitise a fast moving consumer goods (FMCG) processing system using an automated cleaning-in-place (CIPl svstem	Level 2	5

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	14804	Demonstrate knowledge of Good Manufacturing Practices in a Chemical Manufacturino enviroment	Level 2	6
Elective	10252	Identify, inspect, use, maintain and care for engineering hand tools	Level 2	6
Elective	110012	Operate Equipment	Level 2	10
Elective	119744	Select, use and care for enaineerina hand tools	Level 2	8
Elective	12219	Select, use and care for enaineerino power tools	Level 2	6
Elective	117924	Use a Graphical User Interface (GUI)-based word processor to format documents	Level 2	5
Elective	246507	Fill pressurized containers to produce aerosols	Level 3	8
Elective	12319	Perform change overs in a production or packaging environment	Level 3	7
Elective	246506	Produce chemical products using automated batching svstems	Level 3	15
Elective	116942	Use a GUI-based word processor to create merged documents	Level 3	3
Elective	119078	Use a GUI-based word processor to enhance a document throuah the use of tables and columns	Level 3	5
Elective	114600	Apply innovative thinking to the development of a small business	Level 4	4
Elective	117927	Use a Graphical User Interface (GUI)-based database application to solve a aiven problem	Level 4	6
Fundamental	13912	Apply knowledge of self and team In order to develop a plan to enhance team performance	Level 3	5
Fundamental	9010	Demonstrate an understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	Level 3	2
Fundamental	9013	Describe, apply, analyse and calculate shape and motion in 2-and 3-dimensional space in different contexts	Level 3	4
Fundamental	119457	Interoret and use information from texts	Level 3	5
Fundamental	9012	Investigate life and work related problems using data and probabilities	Level 3	5
Fundamental	119467	Use language and communication in occupational learnina orocrernrnes	Level 3	5
Fundamental	7456	Use mathematics to investigate and monitor the financial aspects of personal, business and national issues	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Produce chemical products using automated batching systems

SAQA USID	*UNIT STANDARD TITLE*		
246506	Produce chemical products using automated batching systems		
ORIGINATOR		*PROVIDER*	
Chemical Industries SGB			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	115

SPECIFIC OUTCOME 1
Prepare to mix ingredients for production.

SPECIFIC OUTCOME 2
Operate automated mixing systems to produce chemical products.

SPECIFIC OUTCOME 3
Stage bulk products for further processing or packing.

SPECIFIC OUTCOME 4
Shut down and clean automated systems.

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UNIT STANDARD:

Fill pressurized containers to produce aerosols

SAQA USID	***UNIT STANDARD TITLE***		
246507	Fill pressurized containers to produce aerosols		
ORIGINATOR		***PROVIDER***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technoloov		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Reaular	Level 3	18

SPECIFIC OUTCOME 1
Prepare production machinery for aerosol production.

SPECIFIC OUTCOME 2
Fill aerosol containers with product.

SPECIFIC OUTCOME 3
Conduct post filling activities.

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DRSBHIKHA
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Certificate: Automated Packaging Operations

SAQA QUALID	*QUALIFICATION TITLE*		
58975	National Certificate: Automated Packaging Operations		
ORIGINATOR		*PROVIDER*	
Chemical Industries 5GB			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
National Certificate	6 - Manufacturing, Engineering and Technology	Manufacturing and Assembly	
ABET BAND	*MINIMUM CREDITS*	*NQF LEVEL*	*QUAL CLASS*
Undefined	120	Level 3	Regular-Unit Stds Based

PURPOSE OF THE QUALIFICATION
Purpose:

This qualification is aimed at the learner who wants to obtain the standards and the range of learning required for the packaging of chemical and chemically related products, where the packaging process is primarily automated. It is also aimed at the learner who already has the above mentioned skills, and wants to obtain national recognition for these competencies through a process of Recognition of Prior Learning (RPL).

Qualifying learners will be able to understand the importance and use of packaging, Package products according to Company standards, Maximise quality and workplace productivity, Perform basic maintenance on the equipment. Operate effectively within the context of relevant safety, health and environment, and Co-ordinate people and activities in his/her area.

Rationale:

Packaging forms a critical part of manufacturing, especially in the production of goods that are branded and sold in the retail trade. In the Chemical Industries alone, the following sub-sectors engage in packaging activities: Fast Moving Consumer Goods, including cosmetics, household and personal products; Pharmaceuticals, Surface Coatings, various fine and speciality chemicals, petroleum blending and fertilizers intended for home use. Other than the Chemical Industries, Packaging is an integral part of a number of other industries, especially in Food and Beverage, and Dairy. In short, Packaging is required for all products that are packaged and branded.

The following Packaging qualifications have been registered on the NQF Level 3 National Certificate: Beverage Packaging (ID22054), which is specific to bottling of beverages, and is not standards-based; National Certificate: Cigarette Packaging (1049078), which is focused on cigarette packaging; and The National Certificate in Seed Processing and Packing (1048656), designed specifically for the Agricultural Sector.

None of the above mentioned qualifications meet the needs of this proposed qualification, as they focus on their individual products and are not sufficiently broad to incorporate the range of packaging knowledge and skills required.

This qualification therefore reflects the workplace-based need within the chemical industries. The qualification is a generic requirement for packaging in the Chemical manufacturing sector, and has been identified as a priority in the Chemical Industries Sector Skills Plan.

The qualification provides the flexibility to articulate to manufacturing activities in the broader Chemical Sector, but does not exclude the Food and Beverage, and other similar sectors.

The qualification also provides learners with appreciation of business principles and practices to enhance the understanding of their contribution and impact on profitability and sustainability.

Chemical industry applies innovation and technology in order to provide the packaging excellence demanded by retailers and consumers. **It** follows that there is a constant demand for well-trained people capable of optimising the role played by machinery in our industry.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING* ASSUMED *IN PLACE
It is assumed that learners are already competent in:

• Communication and Mathematical Literacy at NQF Level 2.

Recognition of Prior Learning:

This qualification recognizes the experience and expertise of operators who do not have formal qualifications aligned to this qualification. RPL assessment may be conducted for parts or all of this qualification.

Access to the Qualification:

Access to this qualification is open bearing in mind learning assumed to be in place.

QUAL/FICA TION RULES
• Learners must complete 56 Core and 36 Fundamental unit standards totalling 92 credits.
• A minimum of 28 credits must be chosen from the elective component of the qualification with consideration of the preferred learning pathways.
• A minimum of 120 credits is required to obtain the qualification.

EXIT LEVEL OUTCOMES
1. Package products using automated packaging equipment according to legislative and company requirements.

2. Maintain health, safety and quality assurance practices in a packaging environment.

3. Demonstrate an understanding of basic economic and business principles.

4. Communicate orally and in writing in order to co-ordinate the activities of people and packaging lines.

5. Use mechanical skills to perform routine maintenance and changeovers on packaging machinery.

Critical Cross-Field Outcomes:

While performing packaging functions, qualifying learners can:

Identify and solve problems using critical and creative thinking, through:
• Packaging products to specification and within the timeframes recognized as good practice.
o Evident in Exit Level Outcomes 1 and 2.
• Explaining how individual actions can impact on profit and loss, and cash flow.
o Evident in Exit Level Outcome 3.
• Performing machine change overs and routine maintenance.
o Evident in Exit Level Outcome 5.

Work effectively with others as a member of a team, group, organisation or community by:
• Optimisation of team performance.
o Evident in Exit Level Outcome 4.
• Mediation of differences of opinion in a manner that reduces conflict and focuses on the task at hand.
o Evident in Exit Level Outcome 4.
• Communicating orally and in writing to suit appropriate contexts.
o Evident in Exit Level Outcome 4.

Organise and manage oneself and one's activities responsibly and effectively by:
• Demonstrating the importance and interactive role of safety with regards to employer, employee and global best practices.
o Evident in Exit Level Outcome 2.
• Maintaining personal hygiene and health.
o Evident in Exit Level Outcome 2.

Collect, analyse, organise and critically evaluate information by:
• Allocating resources and using them in a cost-effective way.
o Evident in Exit Level Outcome 3.
• Perform change overs according to production plan.
o Evident in Exit Level Outcome 5.

Communicate effectively by using mathematical and/or language skills in the modes of oral and/or written presentations by:
• Performing written and verbal communications to suit different workplace audiences.
o Evident in Exit Level Outcome 4.
• Debating and discussing the benefits of packaging, impact of quality, consequences of non-conformance in product and packaging quality.
o Evident in Exit Level Outcomes 1 and 3.
• Preparing and presenting reports.
o Evident in Exit Level Outcome 4.

Use science and technology effectively and critically, showing responsibility towards the environment and health of others by:
• Packaging products on automated machinery.
o Evident in Exit Level Outcome 1.
• Changing over packaging machinery.
o Evident in Exit Level Outcome 5.
• Performing maintenance on packaging machinery.
o Evident in Exit Level Outcome 5.

Demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation by:
• Monitoring and controlling quality assurance in product and packaging.
o Evident in Exit Level Outcome 1.

• Understanding the interactive role of safety with regard to employer, employee and global best practices.
a Evident in Exit Level Outcome 2.
• Demonstrating understanding of basic economic and business principles.
a Evident in Exit Level Outcome 3.

Contribute to the full personal development of each learner and the social and economic development of the society at large by:
• Maintaining and applying safety and quality practices.
a Evident in Exit Level Outcome 4.
• Demonstrating an understanding of basic economic and business principles.
o Evident in Exit Level Outcome 2.

ASSOCIATED ASSESSMENT CRITERIA
Associated Assessment Criteria for Exit Level Outcome 1:

• Products are packaged to specification, and within the timeframes recognized as good practice.
• The importance of correct packaging and labelling is explained, with reference to legislation, Company requirements and the end users.

Associated Assessment Criteria for Exit Level Outcome 2:

• The interactive role of safety with regard to employer, employee and global best practices is explained within an automated packaging environment.
• The quality assurance system and quality objectives, standards and elements pertaining to automated packaging are explained in accordance with specified requirements.
• Personal hygiene and due care to fellow workers is adhered to at all times.

Associated Assessment Criteria for Exit Level Outcome 3:

• Allocated resources are used in accordance with specified requirements.
• Explanations are made on how individual actions can impact on profit and loss, and cash flow.
• Supply and demand of goods and services are identified and discussed with regard to consumer behaviour and factors of production.

Associated Assessment Criteria for Exit Level Outcome 4:

• Information is gathered from a range of sources and summarised and reported in accordance with the specified requirements.
• Automated Packaging issues are discussed and resolved in work area on a regular basis with other team members, internal customers and supervisors/management.
• Working Relationships with peers and supervisory/management levels are established and maintained in accordance with specified requirements.

Associated Assessment Criteria for Exit Level Outcome 5:

• Machine change overs are performed according to production planning requirements.
• Routine maintenance is conducted on packaging machinery in accordance with set requirements.

Integrated Assessment:

The applied competence (practical, foundational and reflexive competencies) of this qualification will be achieved if the learner is able to package products in accordance with requirements, maintain health, safety and quality assurance practices, demonstrate an understanding of basic

economic and business principles, communicate appropriately orally and in writing, and perform routine maintenance and changeovers on packaging machinery.

All critical cross-field outcomes identified in the qualification, must be assessed through assessment activities that combine practical, foundational and reflexive competencies. Assessment methods and tools must be designed to determine the whole person development and integration of applied knowledge and skills.

In formative as in summative assessment the Assessor should look for opportunities to maximise integration of the various outcomes in the qualification. The final summative assessment must be based on an Assessment Guide that describes how the different aspects of the performance will be assessed, in terms of a variety of assessment methods. The use of log books and portfolios of evidence may also be considered in the design of assessment.

The learner may choose in which language s/he wants to be assessed. This should be established as part of a process of preparing the learner for assessment and familiarising the learner with the approach being taken. As writing is integral to this qualification, a scribe may not be appointed for any part of the assessment.

Assessors need to ensure that the 12 principles of assessment have been met, and this includes the evaluation of evidence to verify that the learner has been performing consistently over a period of time.

INTERNATIONAL COMPARABIUTY

The South African, New Zealand and Australian qualifications are similar in terms of the communication and language, and mathematic literacy components when compared with other countries. Benchmarking was done against these two Frameworks as well as the English NVQ the Scottish SVQ, in which countries the Packaging industry is well advanced.

International comparability could be found for a similar qualification progression although not a on the same level. Qualifications referred to are:

- Packaging Operations Levels 1 and 2 (VQSET) -101051085 and 1051086.
- Performing manufacturing Operations (City and Guilds) -101026228.
- A number of unit standards were found on the NZQA related to Packaging in food and related (inclUding chemically-related FMCG) at Level 3.

Other than qualifications acknowledged by various national qualifications frameworks, it is apparent by looking through Packaging Professional Bodies, that each country reviewed offers one or more Packaging qualification. The Institute of Packaging (UK) offers a Certificate in Packaging Technology at an approximate equivalent of NQF Level 3, which has World Packaging Organisation stamp of approval, and is also used in Australia. The Institute of Packaging (Ireland) offers its own Introduction to Packaging, and Certificate Course, which appears to be at the equivalent of NQF Level 3. In the Irish qualifications the emphasis is more on Packaging materials design and development, as opposed to Packaging Operations. Institutes of Packaging in China, Taiwan, India and France, amongst others, offer courses relating to both packaging materials design and packaging operations, at various levels of the NQF.

ARTICULATION OPTIONS

This qualification allows for both horizontal and vertical articulation. Horizontal articulation can occur with the:

.1023274: National Certificate: Mechanical Engineering: Fitting, NQF Level 3.

Vertical articulation can occur with the:

.1048915 Further Education and Training Certificate: Manufacturing and Assembly Operations Supervision, NQF Level 4.
• 10 23953 Further Education and Training Certificate: New Venture Creation (SMME), NQF Level 4.

MODERATION OPTIONS

• Anyone assessing a learner or moderating the assessment of a learner against this qualification must be registered as an Assessor or Moderator with the appropriate ETQA.

• Any institution offering learning that will enable the achievement of this qualification must be accredited as a provider with, or have its programme approved by, the relevant ETQA.

• Assessment and moderation of assessment will be overseen by the relevant ETQA according to the ETQA's policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQAs (including professional bodies); and in terms of the moderation guideline detailed immediately below.

• Moderation must include both internal and external moderation of assessment, and should encompass achievement of the competence described in individual unit standards and exit level outcomes, as well as the integrated competence described in the qualification.

• Anyone Wishing to be assessed against this qualification may apply to any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

For an applicant to register as an assessor, the applicant needs:

• A similar qualification at one level higher than the level of the qualification.
• Registration as an assessor with the relevant ETQA.

NOTES

N/A

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	13221	Perform routine maintenance	Level 2	8
Core	8000	Applv basic business principles	Level 3	9
Core	13234	Apply quality procedures	Level 3	8
Core	246509	Demonstrate understanding of good health, safety, hygiene and environmental practices in a manUfacturing environment	Level 3	8
Core	246510	Packaoe product usino automated packaqlnq equioment	level 3	10
Core	12319	Perform change overs in a production or packaging environment	level 3	7
Core	242821	Identify responsibilities of a team leader in ensuring that oreanisational standards are met	Level 4	6
Elective	9877	Assemble components	Level 2	12
Elective	14804	Demonstrate knowledge of Good Manufacturing Practices in a Chemical Manufacturino enviroment	Leve/2	6
Elective	119744	Select, use and care for enoineerino hand tools	Level 2	8
Elective	12219	Select use and care for engineering power tools	Level 2	6
Elective	246508	Demonstrate understanding of product packaging in the chemical manufacturino industries	Level 3	8
Elective	14801	Solve operating problems using process chemistry and related tech noloov	Level 3	10
Elective	116942	Use a GUI-based word processor to create merged documents	Level 3	3
Elective	119078	Use a GUI-based word processor to enhance a document	Level 3	5

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
		throuch the use of tables and columns		
Elective	116940	Use a Graphical User Interface (GUII-based spreadsheet application to solve a given problem	Level 3	6
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	13912	Apply knowledge of self and team in order to develop a plan to enhance team performance	level 3	5
Fundamental	9010	Demonstrate an understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	Level 3	2
Fundamental	9013	Describe, apply, analyse and calculate shape and motion in 2-and 3-dimensional soace in different contexts	LevelS	4
Fundamental	119457	Interoret and use information from texts	level 3	5
Fundamental	9012	Investigate life and work related problems using data and probabilities	Level 3	5
Fundamental	7456	Use mathematics to investigate and monitor the financial asoects of cersonal, business and national issues	Level 3	5
Fundlamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of product packaging in the chemical manufacturing industries

SAQAUSID	*UNIT STANDARD TITLE*		
246508	Demonstrate understanding of product packaging in the chemical manufacturinc industries		
ORIGINATOR		*PROVIDER*	
Chemical Industries 5GB			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Reaular	Level 3	18

SPECIFIC OUTCOME 1
Describe and discuss product packaging requirements.

SPECIFIC OUTCOME 2
Describe primary and secondary packaging operations.

SPECIFIC OUTCOME 3
Explain the requirements for the storage, distribution and handling of packaging materials and finished goods.

SOUTH AFRICAN QUALIFICA1"IONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of good health, safety, hygiene and environmental practices in a manufacturing environment

SAQAUSID	*UNIT STANDARD TITLE*		
246509	Demonstrate understanding of good health, safety, hygiene and environmental practices in a manufacturing environment		
ORIGINATOR		*PROVIDER*	
Chemical Industries 5GB			
FIELD		*SUBFIELD*	
6 - Manufacturina, Enaineerina and Technoloav		Manufacturina and Assemblv	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	I *CREDITS*
Undefined	Regular	Level 3	18

SPECIFIC OUTCOME 1
Apply relevant safety, health and environment legislation and Company policy.

SPECIFIC OUTCOME 2
Discuss safe and environmentally correct practices in a manufacturing environment.

SPECIFIC OUTCOME 3
Maintain personal hygiene and health in a manufacturing environment.

SPECIFIC OUTCOME 4
Identify sound manufacturing practices.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Package product using automated packaging equipment

SAQA USID	*UNIT STANDARD TITLE*		
246510	Package oroduct using automated eackaoino eauioment		
ORIGINATOR		*PROVIDER*	
Chemical Industries 8GB			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technoloqv		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Regular	Level 3	10

SPECIFIC OUTCOME 1
Describe and discuss product packaging requirements.

SPECIFIC OUTCOME 2
Prepare to package product.

SPECIFIC OUTCOME 3
Operate automated packaging equipment to package products.

SPECIFIC OUTCOME 4
Shut down and clean packaging equipment.

No. 723 17 August 2007

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with RegUlation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Food Manufacturing

registered by Organising Field 06 - Manufacturing, Engineering and Technology, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saga.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and no *later than* 17 *September 2007.* All correspondence should be marked Standards Setting - Food Manufacturing and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 - 431-5144
e-mail: dmphuthing@saqa.org.za

DRS BHIKHA
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUAUFICATION:
Nation«l Certificete: BISCUIt Manufacturmg

SAQA QUALID	*QUAUFICATION TITLE*		
58953	National Certificate: Biscuit Manufacturing		
ORIGINATOR		*PROVIDER*	
5GB Food Manufacturing			
QUAUFICATION TYPE	*FIELD*	*SUBFIELD*	
National Certificate	6 - Manufacturing, Engineering and Technology	Manufacturing and Assembly	
ABET BAND	*MINIMUM CREDITS*	*NQFLEVEL*	*QUAL CLASS*
Undefined	128	Level 3	Regular-Unit 5tds Based

PURPOSE OF THE QUAUFICATION
Purpose:

The purpose of this qualification is for leamers to be able to manufacture biscuits according to specified standards of quality while ensuring healthy, safe environments. Improved health and safety in manufacturing has a positive social and economic impact, by decreasing social ad economic costs related to accidents, injury and illness. Also, by improving competence, manufacturing standards are improved, thus contributing to better biscuit products, and ultimately also better production in the manufacturing field.

Through this qualification, biscuit manufacturing competence forms part of an integrated national framework for learning achievements. It is aimed at facilitating access to education, training and career paths for biscuit manufacturers, ensuring learner mobility and progression on the framework through articulation with other qualifications. By setting a national minimum standard for education and training, this qualification will ensure that the quality of education and training is improved, and that learners can gain access to employment opportunities.

This qualification aims to improve the lives of biscuit manufacturers by increasing their access to qualifications, and recognising the achieved competence. Access to further learning will ultimately improve individual earning capability, thus resulting in social and economic transformation. The National Certificate in Biscuit Manufacturing (NQF Level 3) requires that qualifying learners are capable of:

- Communicating in a variety of ways during biscuit manufacturing.
- Using mathematics in biscuit manufacturing processes.
- Using scientific principles in biscuit manufacturing processes.
- Maintaining biscuit manufacturing equipment according to specification.
- Controlling biscuit manufacturing stock to maintain required levels.
- Manufacturing biscuits according to specified procedures using one type of dough.
- Controlling specified biscuit manufacturing processes.

Qualifying learners are also required to elect to be capable of:

- Processing biscuits according to secondary process specification, AND
- Forming dough pieces according to specified biscuit manufacturing procedures for a second type of dough, OR
- Baking biscuits of a second type of dough according to specification, OR

• Mixing a second dough type according to specified procedures.

Rationale:

There is currently no recognised qualification for biscuit manufacturing, and most of the learning required takes place in the workplace. This qualification is aimed at entry-level biscuit manufacturers who operate plant biscuit manufacturing equipment, including travelling band ovens. Typically, learners are employed within the biscuit manufacturing sector, and although they are experienced, they have not had access to a qualification, or the recognition that accompanies a qualification. A qualification not only allows learners to access the field of biscuit manufacturing, but also recognises the competence that current workers in the sector have, thus adding value to their employability and competence, and redressing the lack of access to qualifications. The qualification will ensure that a larger pool of competent biscuit manufacturers is created, thus improving the sustainability of biscuit manufacturing.

Biscuit manufacturing requires a specific focus on quality management to ensure the manufacture of healthy products, safe manufacturing processes, efficient waste management and consumer satisfaction. Employers require the maintenance of high standards in the manufacturing process, to ensure sustainability of their business. For individual learners, achieving this qualification provides access to further learning, and recognition for their specific level of competence.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
The following learning is assumed to be in place upon commencement of the qualification:

• Language and communication competence at NQF Level 2.
• Mathematic literacy at NQF Level 2.
• Clean and sanitise food manufacturing equipment and surfaces manually (NQF Level 1, NLRO 10 Nr9063).
• Maintain personal hygiene, health and presentation in a food or beverage environment (NQF Level 1, NLRO 10 Nr 9018).
• Demonstrate knowledge of introductory principles of chemistry and physics (NQF Level 2, NLRD 10 Nr 9122).

Recognition of Prior Learning:

This qualification can be achieved wholly, or in part, through recognition of prior learning. Evidence can be presented in a variety of forms, including previous international or local qualifications, reports, testimonials, mentoring, functions performed, portfolios, work records and performance records. As such, evidence should be judged according to the general principles of assessment described in the notes to assessors below. Learners who have met the requirements of any Unit Standard that forms part of this qualification may apply for recognition of prior learning to the relevant Education and Training Quality Assurance body (ETQA). The applicant must be assessed against the specific outcomes and with the assessment criteria for the relevant Unit Standards. A qualification will be awarded should a learner demonstrate that the exit level outcomes of the qualification have been attained.

Access to the Qualification:

Access to the qualification is open, provided that the learner is mobile and has the physical ability relevant for specific contexts, for example, moving large quantities of dough around.

QUALIFICATION RULES

• All the Fundamental Component Unit Standards are compulsory (36 credits).
• All the Core Component Unit Standards are compulsory (78 credits).
• For the Elective Component learners are required to attain between 14 and 32 credits out of 107 credits by electing:
o One unit standards for secondary processes (between 5 and 20 credits).
o Form biscuit dough pieces (9 credits) with a second dough type (in addition to the dough type achieved in the core component), OR Bake biscuits using plant ovens (9 credits) for a second dough type (in addition to the dough type achieved in the core component), OR Mix a second biscuit dough type (in addition to the dough type mixing achieved in the core component) (12 credits).

EXIT LEVEL OUTCOMES

1. Communicate in a variety of ways during biscuit manufacturing processes.

2. Use mathematics in biscuit manufacturing processes.

3. Adhere to relevant scientific principles in biscuit manufacturing processes.

4. Maintain biscuit manufacturing equipment according to given requirements.
o Range: Equipment includes oven bands, machines and weighing equipment.

5. Control food manufacturing stock to maintain required levels and minimise waste.

6. Dispense biscuit manufacturing ingredients according to specification.

7. Manufacture biscuits using one dough type according to specified procedures.
o Range: Dough can be sheeted (with/without laminating), or rotary moulded, or deposited, or extruded.

8. Control specified biscuit manufacturing processes, quality and food safety.

Elective (achievement of three outcomes is required to qualify):

9. Process biscuits according to secondary process specification.
AND

10. Form dough pieces according to specified procedures.
o Range: Forming entails producing dough pieces for baking.
o Range: Forming using machines for one type of dough is required.
OR

11. Bake biscuits according to specification.
OR

12. Mix biscuit dough according to specified procedures.
o Range: Mixing of one type of dough is required; dough can be sheeted (withlwithout laminating), or rotary moulded, or deposited, or extruded.

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level Outcome 1:

1.1 Oral communication accommodates audience and context needs.
o Range: audience can include internal organisation customers such as ovensmen, mixers and forming machine operators and suppliers, and communication can be about material or product characteristics and quality.

1.2 Interpretation of information from texts is justified in terms of literal and implicit content of text.
o Range: text includes production plans.
1.3 Use of information from texts is relevant for specified contexts.
1.4 Written texts are relevant for specified communicative contexts, audiences and purpose and are coherent and cohesive.
o Range: written text includes cleaning and sanitising and maintenance documentation, production data and process control parameters that are recorded.
1.5 Editing improves clarity and correctness of own text.
1.6 Use of language and communication in occupational learning programs meet specified requirements.

Associated Assessment Criteria for Exit Level Outcome 2:

2.1 Description of real and imaginary numbers and real number systems is accurate when producing output to planned production targets.
2.2 Derivatives of a range of simple functions are correctly applied to problems involving tangents to curves and rates of change when controlling waste in their operation process.
2.3 Simple forms of complex numbers are correctly identified and applied when measuring production yields.
2.4 Financial aspects of personal, business and national issues are investigated and monitored based on identified mathematic principles when identifying simple variances.
2.5 Description, representation and analysis of shape and motion in 2- and 3-dimensional space is based on structured models when measuring quantities according to the product reeipe.
2.6 Patterns and basic functions used are appropriate for given contexts and problems are solved correctly when following recipe in preparing pre-batch.
2.7 Measurement, estimation and calculation of physical quantities are accurate when controlling heat and cooling utilities.
2.8 Geometrical relationships in 2 and 3 dimensional space are proven for specific contexts when preparing biscuit products within dough prior to heating and baking.

Associated Assessment Criteria for Exit Level Outcome 3:

3.1 Temperatures are controlled according to specification.
3.2 Dissolving and melting processes adhere to given procedures and specifications.
3.3 Heat transfer is described in terms of specific scientific principles.
3.4 Error of parallax is avoided.
3.5 Calibration and tare are accurate.
3.6 Chemical reactions within specific contexts are accurately described.
3.7 Evaporation is explained in terms of specific contexts.
3.8 Description of electrical current is accurate for specific contexts.
3.9 The relationship between micro-organisms and food spoilage is accurately described.

Associated Assessment Criteria for Exit Level Outcome 4:

4.1 EqUipment is cleaned at specified points in the manufacturing processes.
4.2 Cleaning and sanitising of equipment meets specified manufacturer, health, safety and environmental requirements.
4.3 Purpose/use of specific equipment and machines is correctly identified according to specified procedures.
4.4 Equipment settings meet specified requirements.
4.5 Health and safety requirements are adhered to.

Associated Assessment Criteria for Exit Level Outcome 5:

5.1 Storage of materials meets specified requirements.
o Range: materials can be raw materials, work in progress materials, dough for reworking, toppings (laminating powder, sugar, seed, salt, etc.) etc.
5.2 Stock taking is accurate.
o Range: stock taking can include checking quantities and quality.
5.3 Stock identification is accurate.
5.4 Stock order placement meets specified requirements.
5.5 Stock rotation principles are adhered to.
5.6 Health and safety requirements are adhered to.

Associated Assessment Criteria for Exit Level Outcome 6:

6.1 Raw materials are accurately identified.
o Range: identification can be based on reading labels and sensory evaluation.
6.2 Raw materials selected are fit-for-use.
oRange: fit-for-use includes that materials are not damaged, contaminated, er elCpired.
6.3 Measurement of raw materials is accurate.
6.4 Recipes and manufacturing specifications are correctly followed according to specified procedures.
6.5 Pre-processing of ingredients meets specified requirements.
6.6 Health and safety requirements are adhered to.

Associated Assessment Criteria for Exit Level Outcome 7:

7.1 Biscuit dough mixing, dough piece forming and biscuit baking meet given specifications.
7.2 Ingredients are accurately identified.
o Range: ingredients that must be identified are scaled individually.
7.3 Mixing procedures and recipes are followed correctly according to specified procedures.
7.4 Dough types are accurately identified.
7.5 Oven types, oven band types and energy sources are correctly identified according to specified procedures.
o Range: ovens can include gas or electrical ovens.
7.6 Operation of machines and equipment meets specified manufacturer, health, safety and environmental requirements.
7.7 Control of outputs meets given requirements.
7.8 Output quality is checked against specified criteria and corrective action is taken where necessary according to specified procedures.
o Range: quality includes appearance, feel, smell, etc.
7.9 Principles regarding food contact and non contact surfaces are adhered to.
7.10 Process parameters are set and adjusted and outputs are monitored to meet given specifications and requirements.
7.11 Scheduling and sequencing meets requirements of specified manufacturing process.
7.12 Biscuit characteristics are measured and monitored according to given specifications and procedures.
7.13 Manufacturing conditions are controlled according to given specifications.

Associated Assessment Criteria for Exit Level Outcome 8:

8.1 Quality and process requirements are accurately identified.
8.2 Control is based on all relevant information.
8.3 Decisions are justified in terms of quality and process information.
8.4 Critical control points are accurately identified.
8.5 Critical control point functionality is checked according to given specifications.
8.6 Critical control point problems are addressed according to given procedures for specific contexts.

8.7 Hazards outside prescribed limits are accurately identified and action taken meets specified requirements.
o Range: hazards include food safety hazards.

Associated Assessment Criteria for Exit Level Outcome 9:

9.1 Secondary processes are accurately described and identified.
9.2 Preparation for secondary processes meets specified requirements.
9.3 Secondary processes meet specified requirements for specific contexts and processes.

Associated Assessment Criteria for Exit Level Outcome 10:

10.1 Operation of dough forming machines and equipment meets specified manufacturer, health, safety and environmental requirements.
10.2 Control of dough forming outputs meets given requirements.
10.3 Specific equipment is used only for forming relevant type of dough.
10.4 Principles regarding food contact and non contact surfaces are adhered to.
10.5 Process parameters are set and adjusted to produce dough pieces that meet specifications.
10.6 Checking of weight and appearance of dough pieces is based on given criteria.

Associated Assessment Criteria for Exit Level Outcome ·11:

11.1 Process parameters are set and adjusted to produce biscuits that meet quality requirements and specifications.
o Range: process parameters can include oven band speed, temperature, air flow, moisture, weight, turbulence, etc.
11.2 Process parameter adjustment is justified in terms of measurement information.
o Range: measurement information can be about colour, weight, moisture etc.
11.3 Oven conditions are balanced and controlled according to specifications.
11.4 Oven types, oven band types and energy sources are correctly identified according to specified procedures.
11.5 Production meets requirements for packing and adheres to given production plans.
11.6 Biscuit characteristics are measured and monitored according to given specifications and procedures.
11.7 Ovens are lit and shut down safely and according to given specifications.
o Range: ovens can include gas or electrical ovens.

Associated Assessment Criteria for Exit Level Outcome 12:

12.1 Ingredients are accurately identified.
o Range: ingredients that must be identified are scaled individually.
12.2 Labelling system requirements are adhered to.
12.3 Pre-processing of ingredients meets specified requirements.
12.4 Specified loading sequence is adhered to.
12.5 Mixing of dough follows specified sequence.
12.6 Mixing procedures and recipes are followed correctly according to specified procedures.
12.7 Health and safety requirements are adhered to.
12.8 Equipment settings are correct according to given specifications.
12.9 Temperature is control according to given specifications.
12.10 Principles regarding food contact and non contact surfaces are adhered to.
12.11 Mixing scheduling meets requirements of specified manufacturing process.
12.12 Process parameters and outputs are monitored in terms of pre-mixing, mixing and post mixing requirements.

o Range: requirements can relate to water jacket cooling, temperature, rework dough addition, water quantities, storage, ling down time, quantities of liquid nitrogen, etc.
12.13 Dough quality is checked against sensory criteria and corrective action is taken where necessary according to specified procedures.
o Range: quality includes appearance, feel, smell, etc.

Integrated Assessment:

The assessment criteria in the unit standards are performance-based, assessing applied competence of biscuit baking practitioners, rather than only underpinning knowledge, or only skills. The critical cross-field outcomes are also achieved in the unit standards. In addition to the competence assessed to achieve the unit standards, learners must demonstrate that they can achieve the outcomes in an integrated manner, dealing effectively with different and random demands related to biscuit manufacturing occupational and learning contexts, to qualify, and assessment approaches used should be appropriate for assessing applied competence of biscuit manufacturers. Integrated assessment is meaningful if there are clear relationships between the purpose statement, exit level outcomes and integrated assessment of this qualification.

Learners who qualify must be able to integrate concepts, ideas and behaviours across unit standards to achieve the purpose of the qualification. Evidence (as specified in the associated assessment criteria) is required that the learner is able to achieve the exit level outcomes of the qualification as a whole and in an integrated way, and thus its purpose, at the time of the award of the qualification.

Evidence of integration may be presented by learners when being assessed against the unit standards, and separate assessment for integration may not be necessary. Workplace experience can be recognised when assessing towards this qualification. Integrated assessment should include observable performance as well as the quality of thinking behind such performance. Formative assessment can be employed during learning towards the unit standards and during integration to achieve exit level outcomes, to ensure that integration takes place when summative assessment is employed.

INTERNATJONAL COMPARABILITY

The South African and Australian qualifications are unique in terms of the communication and language, and mathematic literacy components when compared with other countries. Internationally, biscuit manufacturing happens in most countries in the world. Some of the major players in biscuit manufacturing are being USA, the United Kingdom, Brazil, Australia, New Zealand and Germany. South Africa produces biscuits for local markets and can not be considered a major global player.

In the United Kingdom (UK), biscuit manufacturing forms competence is addressed in vocational qualifications for Food and Drink Manufacturing Operations, at the equivalent of South African NQF Levels 1, 2, 3 and 4. The UK qualification that is the equivalent of this qualification (Food and Drink Manufacturing Operations Level 3) credits the same compulsory areas of competence as this South African qualification:

- Achieve product specification and operational targets.
- Establish and maintain positive working relationships.
- Identify and diagnose problems.
- Maintain and improve hygienic work practices.
- Maintain and promote healthy and safe work practices within the workplace.
- Obtain information for decision making.
- Contribute to risk assessment in the workplace.
- Maintain and improve product safety.
- Maintain operations.

- Record and store information.
- Select and implement solutions to problems.
- Work with others to achieve goals.
- Analyse information to support decision making.
- Contribute to your own development.
- Advise and inform others.

Electives contained in the UK qualification are different. Where the South African qualification focuses on secondary processes and additional manufacturing competence, the UK qualification includes auditing, operational improvement, human resource management, procurement, product development, coaching, team leading, and environmental practice improvement as elective components. Other UK elective components are part of the core of this South African qualification:

- Monitor and maintain the handling and storage of materials.
- Start up and shut down multi-stage manufacturing operations.
- Contribute to the maintenance of plant and equipment.
- Implement quality assurance systems.
- Support the efficient use of resources.

Biscuit manufacturing courses found in Germany contain fewer credits (approximately 15 credits). Although the embedded knowledge in the South African qualification is also contained in the German courses, the practical component of the courses is limited to spread testing, observing the functioning of raw materials in final products, wire cutting and depositing, rotary moulding, baking hard sweet biscuit making, dough preparation for crackers, deposits, wafer baking, cream spreading, and cutting. Competence is limited to one type of machinery, and focuses on theory underpinning biscuit manufacturing, trouble shooting and product development.

The Australian qualifications framework contains an equivalent one-year qualification (Certificate II in Food Processing (Plant Baking).

The qualification is aimed at an operational level, and includes tempering processes, purification processes, routine maintenance, implementing health, safety and environment and food safety policies, systems and procedures, loading, unloading, and transporting food, implementing sampling procedures, participating in sensory analyses, applying principles of statistical process control, manufacturing extruded and toasted products, operating a forming/shaping process, implementing quality systems and procedures, cleaning and sanitising and sanitising equipment, work with temperature controlled stock, dispensing of non-bulk ingredients, pre-processing raw materials, presenting and applying workplace information, and operating:

- Baking processes.
- Bulk dry goods transfer processes.
- Bulk liquid transfer processes.
- Depositing processes.
- Form, fill and seal processes.
- Heat treatment processes.
- High speed wrapping processes.
- Mixing/blending processes.
- Processes control interface.
- Production processes.
- Enrobing processes.
- Evaporation processes.
- Extrusion processes.
- Coating application processes.

The qualification also includes components that are not in the South African qualification, such as operating a spreads production process, filtration process, drying process, cooking process, frying process, reduction process, retort process, separation process, homogenising process, blending, sieving and bagging process, case packing process and packaging, pumping equipment operation. The Australian qualification includes work in a socially diverse environment, filling and closing product in cans, loading and unloading tankers and working in a clean room environment and a freezer storage area, not included in the South African qualification.

The equivalent New Zealand qualification (Food Production - Baking Level 3) contains similar credits, although the credits are spread over more levels that the South African qualification. However, the most significant differences are the inclusion of supervisory, industry specific, business and management, quality management, computing, mechanical engineering, hospitality, lifting equipment, retail and wholesale, selling and storekeeping and warehousing, and assessment competence in the elective component of the New Zealand qualification. Lower level competence not included in the South African qualification relates to health and safety, communication, legislation, and personal presentation. Biscuit manufacturing in the New Zealand qualification is addressed in the elective component, along with meat processing and dairy manufacturing options.

ARTICULATION OPTIONS

Vertical articulation is possible with all NQF Level 4 qualifications, by means of the mathematic literacy fundamental unit standard Measure, estimate & calculate physical quantities & explore, critique & prove geometrical relationships in 2 and 3 dimensional space in the life and workplace of adult with increasing responsibilities (12417).

Unit standard 9042 also provides vertical articulation with the following Qualification:

• 1024494: National Certificate: Fresh Meat Processing, NQF Level 3.

Unit standard 9147 with the following Qualification:

.1023138: National Certificate: Food and Beverage Laboratory Practices, NQF Level 3.

Horizontal articulation on the NQF is possible with all NQF Level 3 qualifications, by means of the communication and language, and mathematic literacy fundamental unit standards.

In addition, unit standard 114366 articulates with the following Qualifications:

• 10 20507: National Certificate: Food and Beverage Packaging, NQF Level 3.
• 1020658: National Certificate: Food and Beverage Processing: Plant Baking Processing, NQF Level 3.
• 10 50308: National Certificate: Craft Bread and Flour Confectionary Baking, NQF Level 3.

Unit standard 10702 articulates with the following Qualification:

• 1020658: National Certificate in Food and Beverage Processing: Plant Baking Processing NQF Level 3.

MODERATION OPTIONS

Moderation of assessment and accreditation of providers shall be at the discretion of a relevant ETQA as long as it complies with the SAQA requirements. The ETQA is responsible for moderation of learner achievements of learners who meet the requirements of this qualification. Particular moderation and accreditation requirements are:

• Any institution offering learning that will enable the achievement of this qualification must be accredited as a provider with the relevant ETQA. Providers offering learning towards achievement of any of the unit standards that make up this qualification must also be accredited through the relevant ETQA accredited by SAQA.

• The ETQA will oversee assessment and moderation of assessment according to their policies and guidelines for assessment and moderation, or in terms of agreements reached around assessment and moderation between the relevant ETQA and other ETQAs and in terms of the moderation guideline detailed here.

• Moderation must include both internal and external moderation of assessments for the qualification, unless the relevant ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described in Unit Standards as well as the integrated competence described in the qualification.

• Internal moderation of assessment must take place at the point of assessment with external moderation provided by a relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.

• Anyone wishing to be assessed against this qualification may apply to be assessed by any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

Assessment of learner achievements takes place at providers accredited by the relevant ETQA (RSA, 1998b) for the provision of programs that result in the outcomes specified for this qualification. Anyone assessing a learner or moderating the assessment of a learner against this qualification must be registered as an assessor with the ETQA. Assessors registered with the relevant ETQA must carry out the assessment of learners for the qualification and any of the Unit Standards that make up this qualification.

To register as an assessor, the following are required:

• Detailed documentary proof of relevant qualification/s, practical training completed, and/or experience gained at a level above the NQF Level of this qualification (Le. NQF Level 4).
• Credit against the relevant assessment unit standard.

Assessors should keep the following general principles in mind when designing and conducting assessments:

• Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the Unit Standards to ensure assessment is integrated rather than fragmented. Remember that the learner should be declared competent in terms of the qualification purpose and exit level outcomes.
• Where assessment across Unit Standard titles or at Unit Standard title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.
• Make sure evidence is gathered across the entire range, wherever it applies.

In particular, assessors should assess that the learner demonstrates an ability to consider a range of options by:

• Measuring the quality of the observed practical performance as well as the theory and underpinning knowledge.
• Using methods that are varied to allow the learner to display thinking and decision making in the demonstration of practical performance.

• Maintaining a balance between practical performance and theoretical assessment methods to ensure each is measured in accordance with the level of the qualification.
• Taking into account that the relationship between practical and theoretical components is not fixed, but varies according to the type and level of qualification.

All assessments should be conducted in line with the following well-documented principles:

• Appropriate: The method of assessment is suited to the performance being assessed.
• Fair: The method of assessment does not present any barriers to achievements, which are not related to the evidence.
• Manage: The methods used make for easily arranged cost-effective assessments that do not unduly interfere with learning.
• Integrate into work or learning: Evidence collection is integrated into the work or learning process where this is appropriate and feasible.
• Valid: The assessment focuses on the requirements laid down in the standards; i.e, the assessment is fit for purpose.
• Direct: The activities in the assessment mirror the conditions of actual performance as close as possible.
• Authentic: The assessor is satisfied that the work being assessed is attributable to the learner being assessed.
• Sufficient: The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.
• Systematic: Planning and recording is sufficiently rigorous to ensure that assessment is fair.
• Open: Learners can contribute to the planning and accumulation of evidence. Learners for assessment understand the assessment process and the criteria that apply.
• Consistent: The same assessor would make the same judgement again in similar circumstances. The judgement made is similar than the judgement that would be made by other assessors.

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	9147	Applv microbioloaical orincioles in a food environment	Level 3	6
Core	246480	Bake biscuits usina plant ovens	Level 3	9
Core	246475	Control food manufacturing ingredients	Level 3	5
Core	246481	Control foad manufacturing process parameters and Quality	Level 3	10
Core	9042	Demonstrate an understanding of food or beverage safety practices and procedures in the food ar beverage manufacturing environment	Level 3	7
Core	8803	Demonstrate an understanding of heating and cooling procedures	Level 3	4
Core	246484	Form biscuit dough oieces	Level 3	9
Core	246483	Mix biscuit dough	Level 3	12
Core	119802	Perform quality control practices in a food or sensitive consumer product ooeration	Level 3	6
Core	10702	Manage food or beverage raw materials and products in a food or bsverage crccessinc environment	Level 4	10
Elective	246489	Apply flavours to baked biscuit products	Level 3	5
Elective	8883	Cook confectionery mixtures uslna continuous eQuipment	Level 3	12
Elective	8875	Enrobe ccnfectionerv oroducts	Level 3	8
Elective	8865	Manufacture lavered confectionerv oroducts	Level 3	8
Elective	246487	Mix creams for biscuits	Level 3	8
Elective	8880	Manufacture wafer products	Level 4	20
Elective	8877	Refine and conch a chocolate mass or compound	Level 4	16
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	9010	Demonstrate an understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	Level 3	2
Fundamental	9013	Describe, apply, analvse and calculate shape and motion	Level 3	4

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
		in 2-and 3-dimensional soace in different contexts		
Fundamental	119457	Interoret and use information from texts	level 3	5
Fundamental	9012	Investigate life and work related problems using data and probabilities	level 3	5
Fundamental	119467	Use language and communication in occupational leamino oroorammes	level 3	5
Fundamental	7456	Use mathematics to investigate and monitor the financial asoects of personal, business and national issues	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Control food manufacturing ingredients

SAQA USID	*UNIT STANDARD TITLE*		
246475	Control food manufacturing ingredients		
ORIGINATOR		*PROVIDER*	
5GB Food Manufacturina			
FIELD		*SUBFIELD*	
6 - Manufacturina. Engineering and Technology		Manufacturina and Assemblv	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	5

SPECIFIC OUTCOME 1
Identify raw materials from labels and sensory information.

SPECIFIC OUTCOME 2
Check flt-for-use characteristics of raw materials.

SPECIFIC OUTCOME 3
Measure raw materials based on recipes and manufacturing specifications.

SPECIFIC OUTCOME 4
Store raw materials according to given requirements.

SPECIFIC OUTCOME 5
Pre-process ingredients for dispensing.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Bake biscuits using plant ovens

SAQA USID	*UNIT STANDARD TITLE*		
246480	Bake biscuits usina clant ovens		
ORIGINATOR		*PROVIDER*	
SGB Food Manufacturina			
FIELD		*SUBFIELD*	
6 - Manufacturina, Enaineerina and Technoloav		Manufacturina and Assemblv	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Reaular	Level 3	9

SPECIFIC OUTCOME 1
Measure and monitor biscuit characteristics before, during and after baking.

SPECIFIC OUTCOME 2
Determine the impact of dough quality and characteristics based on baking process and outputs.

SPECIFIC OUTCOME 3
Set and adjust process parameters to meet specifications.

SPECIFIC OUTCOME 4
Light up and shut down ovens safely.

SPECIFIC OUTCOME 5
Clean and maintain oven bands.

SPECIFIC OUTCOME 6
Perform First line Maintenance on Baking equipment.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Control food manufacturing process parameters and quality

SAQA USID	*UNIT STANDARD TITLE*		
246481	Control food rnanufacturiq process parameters and cuantv		
ORIGINATOR		*PROVIDER*	
5GB Food Manufacturina			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Reaular	Level 3	10

SPECIFIC OUTCOME 1
Read production plans for manufacturing adherence.

SPECIFIC OUTCOME 2
Record production data regarding process control parameters.

SPECIFIC OUTCOME 3
Control quality and processes to make effective decisions.

SPECIFIC OUTCOME 4
Control critical control points.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

. Mix biscuit dough

SAQA USID	*UNIT STANDARD TITLE*		
246483	Mix biscuit dough		
ORIGINATOR		*PROVIDER*	
8GB Food Manufacturina			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABETBAHD	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Reaular	Level 3	12

SPECIFIC OUTCOME 1
Pre-process ingredients for mixing.

SPECIFIC OUTCOME 2
Mix ingredients using the appropriate machine and sequence.

SPECIFIC OUTCOME 3
Monitor mixing process parameters.

SPECIFIC OUTCOME 4
Check dough quality using sensory information.

SPECIFIC OUTCOME 5
Control dough rework to minimise waste.

SPECIFIC OUTCOME 6
Perform First line Maintenance on Mixing equipment.

SOUTH AFRICAN QUALIFICAtIONS AUTHORITY

UNIT STANDARD:

Form biscuit dough pieces

SAQA USID	*UNIT STANDARD TITLE*		
246484	Form biscuit dough pieces		
ORIGINATOR		*PROVIDER*	
SGB Food Manufacturino			
FIELD		*SUBF/ELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Reoular	Level 3	19

SPECIFIC OUTCOME 1
Control dough forming machines and equipment.

SPECIFIC OUTCOME 2
Set and adjust process parameters to meet specifications.

SPECIFIC OUTCOME 3
Control forming process outputs.

SPECIFIC OUTCOME 4
Control stock for application of layering powder/toppings.

SPECIFIC OUTCOME 5
Perform First line Maintenance on dough forming equipment.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Mix creams for biscuits

SAQA USID	***UNIT STANDARD TITLE***		
246487	Mix creams for biscuits		
ORIGINATOR		***PROVIDER***	
5GB Food Manufacturina			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerina and Technology		Manufacturina and Assemblv	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 3	18

SPECIFIC OUTCOME 1
Pre-process ingredients for mixing.

SPECIFIC OUTCOME 2
Mix ingredients using the appropriate machine and sequence.

SPECIFIC OUTCOME 3
Monitor mixing process parameters.

SPECIFIC OUTCOME 4
Check cream quality using sensory information.

SPECIFIC OUTCOME 5
Perform First line Maintenance on cream mixing equipment.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply flavours to baked biscuit products

SAQA USID	***UNIT STANDARD TITLE***		
246489	Apply flavours to baked biscuit products		
ORIGINATOR		***PROVIDER***	
5GB Food ManufaeturinQ			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerina and Technoloav		Manufacturina and Assemblv	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 3	15

SPECIFIC OUTCOME 1
Describe flavouring of biscuits according to manufacturing requirements.

SPECIFIC OUTCOME 2
Prepare for flaVOUring biscuits according to specified procedures.

SPECIFIC OUTCOME 3
Flavour biscuits according to specified requirements.

SPECIFIC OUTCOME 4
Perform end of biscuit flavouring procedures that meet specified requirements.

SPECIFIC OUTCOME 5
Perform First line Maintenance on flavouring equipment.

No. 724

17 August 2007

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Chemical Industries

registered by Organising Field 06 - Manufacturing, Engineering and Technology, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits. and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saga.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and no *later than* 17 *September 2007.* All correspondence should be marked Standards Setting - Chemical Industries and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 - 431-5144
e-mail: dmphuthing@saqa.org.za

DRS BHIKHA
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Certificate: Industrial Processing

SAQA QUALID	*QUALIFICATION TITLE*		
58955	National Certificate: Industrial Processing		
ORIGINATOR		*PROVIDER*	
Chemical Industries 8GB			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
National Certificate	6 - Manufacturing, Engineering and Technology	Manufacturing and Assembly	
ABET BAND	*MINIMUM CREDITS*	*NQF LEVEL*	*QUAL CLASS*
Undefined	120	Level 2	Regular-Unit Stds Based

PURPOSE OF THE QUALIFICATION
Purpose:

This qualification builds onto the GETC: Chemical Operations. This is a generic industrial processing qualification designed for application in a range of small to medium chemical, detergents, pesticides, herbicides, glass, FMCG, paint and surface coating, pharmaceuticals, fruit juice, base chemicals and various other process operations.

Qualifying learners will:

- Understand the principles of chemistry and their applications in industry.
- Apply safety and environmental protection procedures in the workplace.
- Monitor and control operations in a chemical or process environment.
- Maintain quality in a processing environment.

This competence provides the foundation needed to take responsibility for a significant operation in the industrial processing industry. It also provides the basis upon which further related learning and career development can take place.

Social development and economic transformation are enhanced through efficient task performance, and career development and personal job satisfaction of processing personnel are facilitated through the learning process used to achieve the competency specified.

Rationale:

This qualification replaces:

- The National Certificate in Chemical Manufacturing NQF Level 2.
- The National Certificate in Batch Mixing Operations NQF Level 2.

The changes which have been made to the old qualifications have largely been instrumental to merge the above two qualifications into a more versatile, generic qualification. Changes also aim to address new SAQA qualification requirements, remove overlaps and gaps in the old qualification, address problems experienced with industry implementation and incorporate needs expressed by industry stakeholders.

This qualification is the second in a progression of qualifications for people working in the chemical or processing industries who need to progress beyond NQF Level 2. The qualification reflects the workplace-based common or non-specific needs that a learner requires in the industrial processing industry, before progressing to learning at a higher level.

Typical learners are operating personnel working in a chemical processing plant. The chemical processing industry is well established in South Africa and its success is dependant upon the efficient production of chemical products. Achievement of this objective is largely dependant upon the competence, recognised by this qualification, of the people who operate industrial processing equipment. An adequate number of people with these skills are needed to ensure that the production units in South Africa operate productively.

This qualification will contribute to the full development of the learner within the industrial processing industry by providing recognition, further mobility and transportability within the field. The skills, knowledge and understanding demonstrated within this qualification are essential for social and economic transformation and contribute to the progression and economic growth within the industrial processing and maintenance fraternity.

Through the employment of competent installation personnel, employers and, in turn, the field and sub-field, have confidence that this critical work in the industry is efficiently carried out.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
It is assumed that learners are already competent in:

- Language and mathematical literacy at ABET Level 4/NQF Level 1.

Recognition of Prior Learning:

Recognition of prior learning must be carried out in accordance with the policy and rules specified and used by the ETQA responsible for evaluation of people seeking RPL for a part of the whole qualification.

Access to the Qualification:

Access is open to anyone with access to learning opportunities and work experience on an appropriate selection of systems. The learning assumed to be in place is essential to the leaming specified in this qualification. If the learner is not yet competent in this regard the shortfalls must be addressed prior to commencing with learning specified in this qualification. This is necessary to ensure the safety of the learner, co-workers, the work process and the environment.

Access for learners with disabilities is dependant on the:

- Type and severity of the disability.
- Nature of the operational processes and requirements of the equipment.

QUALIFICATION RULES
Rules of combination:

In the compulsory Fundamental Component of the qualification, a learner must demonstrate his/her competence in the 20 credits in the field of Communication plus 16 credits in the field of Mathematical Literacy.

The unit standards in the compulsory Core Component of the qualification reflect the skills and competencies needed for building expertise in the industrial processing industry. In the Core Component, the learner must demonstrate his/her competence in the total of 51 credits.

The Elective Component of the qualification is made up of the following:

• Compulsory electives: Two Unit standards must be selected from a list of specialist unit standards.

NLRO 10: Compulsory Electives (Choose any two); Level; Credits:

.246476: Produce formulated industrial and consumer products; Level 2; 10 credits.
• 246478: Maintain the integrity of a sensitive manufacturing environment; Level 2; 6 credits.
• 244080: Apply standard operating procedures in a process environment; Level 2; 10 credits.
• 14774: Prepare batches of material using an integrated batch mixing plant; Level 2; 8 credits.
• 110299: Transfer bulk solids; Level 2; 4 credits.

• General application Unit Standards covering aspects such as life skills, business, entrepreneurial, computer, mechanical, packaging and cranage skills complete the qualification.

NLRO 10: Elective Component; Level; Credits:

.246477: Package manufactured products using an automated or semi-automated packaging machine; Level 2; 6 credits.
• 113877: Understand fundamentals of electricity; Level 2; 8 credits.
• 244078: Demonstrate understanding of a work permit system; Level 2; 3 credits.
• 9063: Clean and sanitize a food processing system using a manual cleaning in place (CIP) system; Level 1; 3 credits.
• 8822: Clean and sanitize a food processing system using an automated cleaning in place (CIP) system; Level 2; 5 credits.
• 120239: Monitor critical control points (CCPs) as an integral part of a hazard analysis critical control point (HACCP) system; Level 3; 6 credits.
• 14804: Demonstrate knOWledge of basic Good Manufacturing Practices (GMP) in a chemical manufacturing environment; Level 2; 6 credits.
• 114639: Control waste or effluent water in a manufacturing environment; Level 2; 4 credits.
• 119558: Work with, use and care for materials and resources which impact on health and the environment; Level 2; 10 credits.
• 244071: Apply sampling theory and practice; Level 2; 5 credits.
• 244075: Maintain the quality of products in a production environment; Level 2; 5 credits.
• 244076: Apply elementary statistical process control principles; Level 2; 6 credits.
• 244094: Perform and support maintenance functions; Lever 3; 5 credits.
• 110300: Clean, inspect and lubricate a production machine, and repair minor faults; Level 2; 9 credits.
• 119744: Select, use and care for engineering hand tools; Level 2; 8 credits.
• 244081: Understand the properties and applications of material in a processing environment; Level 2; 5 credits.
• 244095: Dismantle, assemble and install basic components in a process environment; Leve! 3; 6 credits.
• 9599: Lift and move material and equipment by means of a forklift; Level 2; 3 credits.
• 116235: Operate a pendant-controlled overhead crane; Level 2; 5 credits.
• 242981: Operate defined purpose lift trucks; Level 2; 4 credits.
• 12207: Operate moving equipment to stack, destack and position materials; Level 2; 4 credits.
• 120238: Collate and shrink-wrap packaged products using automated wrapping equipment; Level 2; 6 credits.
• 9322: Work in a team; Level 2; 3 credits.
• 114936: Participate effectively in a team or group; Level 2; 2 credits.

- 114974: Apply the basic skills of customer service; Level 2; 2 credits.
- 119666: Determine financial requirements of a new venture; Level 2; 8 credits.
- 119668: Manage business operations; Level 2; 8 credits.
- 119670: Produce a business plan for a new venture; Level 2; 8 credits.
- 119672: Manage marketing and selling processes of a new venture; Level 2; 7 credits.
- 119673: Identify and demonstrate entrepreneurial ideas and opportunities; Level 2; 7 credits.
- 119674: Manage finances for a new venture; Level 2; 10 credits.
- 113924: Apply basic business ethics in a work environment; Level 2; 2 credits.
- 116714: Lead a team, plan, allocate and assess their work; Level 3; 4 credits.
- 246482: Control the activities of a small chemical manufacturing business; Level 2; 6 credits.
- 114981: Capture numerical and text information on an electronic database; Level 2; 2 credits.
- 116937: Use a spreadsheet application to create and edit spreadsheets; Level 2; 4 credits.
- 117924: Use a word processor to format documents; Level 2; 5 credits.

EXIT LEVEL OUTCOMES

When the exit level outcomes for the qualifications were developed, each critical cross-field outcome and the specific skills covered by the qualification was considered and included in the exit level outcomes for the qualification so that these outcomes reflect both in an integrated manner. In terms of process, the exit level outcomes were established first and were based on a skills profile of an operator in that field at that ievel.

1. Understand the principles of chemistry and their applications in industry.

2. Apply safety and environmental protection procedures in the workplace:

3. Monitor and control operations in a chemical or process environment.

4. Maintain quality in a processing environment.

Critical Cross-field Outcomes:

Each critical cross-field outcome was considered in terms of its applicability to each of the specific outcomes for each unit standard. Where it was found to be applicable, the nature of the skills being developed was specified by the working group and captured in the standard.

Critical cross-field outcomes are assessed per unit standards and are part of all exit level outcomes.

Critical cross-field outcomes have been addressed by the exit level outcomes as follows:

Critical cross-field outcomes; Evident in exit level outcome:

While performing integrated industrial processing operations, qualifying learners can:

Identify and solve problems in which response displays that responsible decisions, using critical and creative thinking, have been made by:

- Responding to emergencies in a processing environment; Evident in Exit Level Outcomels 2.
- Monitoring and controlling quality assurance practices; Evident in Exit Level Outcome/s 3, 4.
- Applying operating procedures; Evident in Exit Level Outcome/s 3, 4.
- Controlling variables impacting on processing operations; Evident in Exit Level Outcomels 1, 3,4.

Work effectively with others as a member of a team, group, organisation or community by:

• Working in a coordinated team during system start-up and shut down; Evident in Exit Level Outcome/s 3.
• Co-ordinaling one's work with that of others in the direct surrounding area, internal and external operations; Evident in Exit Level Outcome/s 1, 2, 3, 4.

Organise and manage oneself and one's activities responsibly and effectively by:

• Planning and implementing one's own start-up and shutdown activities; Evident in Exit Level *Outcome/s 3.*
• Planning and implementing one's own routine operational functions; Evident in Exit Level Outcome/s 1, 3, 4.
• Planning and implementing corrective action to maintain product quality; Evident in Exit Level Outcome/s 3, 4.

Collect, analyse, organise and critically evaluate information by:

• Monitoring operational parameters; Evident in Exit Level Outcome/s 3, 4.
• Collating and sorting product quality data; Evident in Exit Level Outcome/s 3, 4.
• Monitoring and interpreting product Quality data and data obtained from product analysis; Evident in Exit Level *Outcome/s* 3, 4.
• Managing records and reports; Evident in Exit Level Outcome/s 1, 2, 3.

Communicate effectively by using mathematical and/or language skills in the modes of oral and/or written presentations by:

• Recording and interpreting instrument readings; Evident in Exit Level Outcome/s 3.
• Using industry terminology in written and verbal reports; Evident in Exit Level Outcome/s 2, 3, 4.

Use science and technology effectively and critically, showing responsibility towards the environment and health of others by:

• Working according to health and safety regulations, Evident in Exit Level Outcomels 2, 3.
• Controlling technologically advanced production equipment according to operating procedures; Evident in Exit Level Outcome/s 3, 4.
• Working and interpreting technologically advanced instrumentation and computer systems; Evident in Exit Level Outcome/s 3, 4.

Demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation by:

• Monitoring and controlling quality assurance practices; Evident in Exit Level Outcome/s 3, 4.
• Adjusting equipment and machinery while taking cognisance of the downstream impact; Evident in Exit Level Outcome/s 1, 2, 3, 4.

Contribute to the full personal development of each learner and the social and economic development of the society at large by:

• Maintaining and applying safety practices in the production environment; Evident in Exit Level Outcome/s 2, 3.
• Maintaining and applying quality practices in the production environment; Evident in Exit Level Outcome/s 3, 4.
• Performing core operating functions; Evident in Exit Level *Outcome/s 3.*

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level Outcome 1:

• The elementary principles of industrial chemistry are explained in terms of generally accepted scientific principles.
• The application of chemistry in manufacturing operations is described by relating the chemical principles to actual industrial examples.

Associated Assessment Criteria for Exit Level Outcome 2:

• Emergency action is taken in line with emergency procedures and as may be dictated by situational considerations to ensure the safety of both personnel and equipment.
• Hazardous chemicals are received, handled and stored as required by plant safety rules and standard operating procedures.
• Environmental protection procedures are applied according to standard operating procedures.

Associated Assessment Criteria for Exit Level Outcome 3:

• The principles of physics related to heat and energy and its application in a processing environment are explained in terms of accepted scientific principles.
• Standard Operating Procedures and/or workplace instructions are applied according to given procedures.
• Process plant and equipment are monitored to detect any operational deviations according to operating schedules, procedures and prevailing operational requirements.
• The principles governing heat transfer, liquid-solid and solid-solid separation processes are explained in terms of accepted scientific principles and applications are described by relating the scientific principles to actual industrial examples.
• Instruments on production or packing equipment are read and adjusted to maintain continued smooth and efficient operation.

Associated Assessment Criteria for Exit Level Outcome 4:

• Weigh raw material for product manufacture in a chemical manufacturing environment.
• Solve operating problems using relevant technologies.
• Take samples of product for analyses.
• Quality of products is maintained within given product specifications and parameters.

Integrated Assessment:

The applied competence (practical, foundational and reflexive competencies) of this qualification will be achieved if a candidate is able to achieve all the exit level outcomes of this qualification.

Appropriate methods and tools must be used to assess practical, foundational and reflexive competence of the learner in all the exit level outcomes listed above, as well as to determine a learner's ability to solve problems, work in a team, organise him/herself, use applied science, and understand the implications of actions and reactions in the world as a set of related systems. Such an assessment process will determine development of the whole person, and the integration of applied knowledge and skills.

Assessors should develop, conduct, and ensure integration of, assessment by making use of a range of formative and summative assessment methods against the unit standards that make up the qualification. Combinations of applied, foundational and reflective competencies, including critical cross-field outcomes, should be assessed wherever possible.

Moderators should ensure that assessment is valid, consistent and integrated into work or learning, and that there is sufficient and authenticated evidence of learner competence against the whole qualification.

INTERNATfONAL COMPARABILITY

An extensive international comparability was done which included the United States of America, Australia, New Zealand, Germany, Britain, European Community Chemical Operator Project and relevant African countries.

United States of America:

In the USA training for chemical process operators are generally considered as on-the-job training with some specialised multi-media and simulator training modules offered by private providers. However a small number of technical colleges offer certificate programmes which are very similar in design to the NQF Level 2 qualification.

Germany:

The German qualification was seen as the best benchmarking partner due to their position as international leaders in the chemical industry in both technical and operational issues. From our firsthand experience, the training provided in this field is partially responsible for their leading position. A contributing factor that leads us to this conclusion is the international regard for German technology. The German two year "Produktionsfachkraft Chemie" (Chemical Production Specialist) qualification was used as basis for the development of the NQF Level 2 Industrial Processing qualification.

The main deviations from the German qualification are:

- No laboratory work is done in the local qualification since this is considered a separate occupation.
- Some of the areas were addressed either earlier or later in the training process in order to minimise the workplace requirements for the NQF Level 1 qualification.
- Subjects were divided and combined in a somewhat different fashion.

Britain:

A comparison with the British qualification was included, because the British chemical industry is very well developed and the NVQ is an educational structure comparable to the, NQF. An intemet search revealed that The British Level 2 NVQ qualification in Chemical, Pharmaceutical and Petrochemical Operations provides for the following areas of specialisation: Process Operations; Process Support Services and Control Operations Process.

When compared to the British qualification, the South African NQF Level 2 qualification has a higher theory component while the British qualification is focused on job skills without any foundational science, process or equipment modules. The qualification contains compulsory core units consisting of safety, teamwork, work handover and a choice of five elective units ranging from processing operations, maintenance of equipment, packaging, transfer of material, to quality management.

European Community Chemical Operator project:

The European Community Project (Leonardo da Vinci) is aimed at establishing common educational and outcomes specifications for chemical operators in the European Union. At this stage of the project, their outcomes are virtually identical to ours, but standards, have not yet been set to indicate how these outcomes would be achieved.

Australia:

The Australian processing industry is of a similar size and sophistication as the South African industry. For this reason a comparison with the Australian qualification was included, as well as

the AQF being an educational structure comparable to the NQF. An internet search of the AQF revealed that the Australian Certificate" in Process Plant Operations contains compulsory core units in communication, safety, quality and work procedures and it allows the learner to choose elective unit standards in domains comparable to the local qualification, e.g. operate and monitor a range of processing equipment.

Africa and SAOC:

African countries with processing facilities (including SAOC countries) were searched for applicable qualifications or training programmes, but no relevant qualifications are offered in any of these countries.

New Zealand:

A comparison with the New Zealand qualification was included because the NZQA is an educational structure comparable to the NQF. The research in the NZQA showed that a Level 2 Certificate in Energy and Chemical Plant Operations (Process Operation) and a similar Level 4 Process Operation qualification are registered. SUbject content is similar to that contained in the South African qualification, namely: communication, safety, quality control and equipment operation, monitoring and maintenance.

Summary:

Both local and international qualifications place high emphasis on safety with a range of unit standards relating to hazards, emergencies and environmental protection included.

The Industrial Processing Qualification compares well with the best international qualifications and training programmes offered. The compulsory technical content incorporated in the qualification will serve to support qualifying learners to make better informed; autonomous decisions within a more compact timeframe than most international learners and will increase transportability of the qualification considerably.

ARTICULATION OPTIONS

This qualification is the second in a series of four processing qualifications and it will allow the learner a vertical progression from the introdUctory Chemical Operations NQF Level 1 qualification to the NQF Level 3 Chemical Operations qualification and culminate in the NQF Level 4 Chemical Operations qualification.

Vertical articulation within the processing industry can occur with the following registered NQF Level 3 qualifications:

- Process Plant Operation.
- 10 58537: National Certificate: Chemical Operations.
- 1048905: National Certificate: Wastewater Reticulation Services.
- 1048916: National Certificate: Explosive Manufacturing Operations.
- 10 48434: National Certificate: Molten Glass Production.
- 10 49555: National Certificate: Operation of Mobile Explosives Manufacturing Units.
- 1049044: National Certificate: Mineral Processing, Gold Extraction.

The generic knowledge and expertise obtained in this qualification enables the learner to progress horizontally in a range of other processing operations or to develop a career where knowledge of process operations is necessary.

Horizontal articulation within the processing industry can occur with the follOWing registered NQF Level 2 qualifications:

• Continuous Processes: Chemical Operations.
• Electrics: Chemical Electrical.
• Mechanics: Chemical Rigging.
• Mechanics: Chemical Turning.
• 1058515: National Certificate: Chemical Operations.
• 1048890: National Certificate: Chemical Liquid, Gas Storage and Transfer.
• ,021494: National Certificate: Dry Lumber Processing.
• 1021490: National Certificate: Lumber Drying.
• ID 35941: National Certificate: Pulp and Paper Manufacturing.

MODERATION OPTIONS
Assessment and Moderation requirements:

• Anyone assessing a leamer or moderating the assessment of a learner against this Qualification must be registered as an assessor with the relevant ETQA.

• Any institution offering learning that will enable the achievement of this Qualification must be accredited as a provider with the relevant ETQA.

• Assessment and moderation of assessment will be overseen by the relevant ETQA according to the ETQAs policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQAs (including professional bodies); and in terms of the moderation guideline detailed immediately below.

• Moderation should also encompass achievement of the competence described both in individual unit standards, exit level outcomes as well as the integrated competence described in the qualification.

CRITERIA FOR THE REGISTRATION OF ASSESSORS
In order to assess this qualification, the assessor needs:

• Assessors to meet the requirements of the generic assessor standards.
• Competence against the unit standard "Conduct outcomes-based assessments".
• Detailed documentary proof of educational qualification, practical training undergone, and/or experience gained at an appropriate level in the work concerning industrial processing operations. This must meet the relevant ETQA policies and guidelines. The SUbject matter expertise of the assessor can be established through the recognition of prior learning.
• Registration with, or recognition by, the relevant ETQA as specified through an appropriate memorandum of understanding.

NOTES
Range statements:

• This qualification addresses the knowledge and competencies required by learners in the industrial processing industries.
• Knowledge relating to the industrial processing includes industry specific equipment and technology, communication, mathematics, applied science, and SHEQ.
• This qualification may be applicable to other processing operations. This is subject to its acceptance by appropriate subject matter experts.

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	115188	Applv environmental protection procedures	Level 2	4
Core	120402	Demonstrate an understanding of introductory principles of chemistry and physics	Level 2	5
Core	246474	Demonstrate understandino of process plant technoloov	Level 2	10

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	246479	Monitor and control product parameters in a manufacturing environment	Level 2	5
Core	244082	Monitor plant and eQuipment in a process environment	Level 2	10
Core	244073	Receive handle and store hazardous chemicals safelv	Level 2	5
Core	244079	Respond to emercencies in a process environment	Level 2	3
Core	244083	Solve operating problems using relevant technoloaies	Level 2	5
Core	110007	Weigh raw materials for product manufacture in a chemical manufacturing environment	Level 2	4
Elective	120410	Clean and sanitise food manufacturing equipment and surfaces manualiV	Level 1	4
Elective	113924	Applv basic business ethics in a work environment	Level 2	2
Elective	244076	Applv elementarv statistical process control principles	Level 2	6
Elective	244071 .	Applv sampiina theory and practice	Level 2	5
Elective	244080	Apply standard operating procedures in a process environment	Level 2	10
Elective	114974	Aooly the basic skills of customer service	Level 2	2
Elective	114981	Capture numerical and text information on an electronic database	Level 2	2
Elective	120405	Clean and sanitise a fast moving consumer goods (FMCG) processing system using an automated cleanin9-in-olace iCIPI svstem	Level 2	5
Elective	110300	Clean inspect and lubricate a production machine, and repair minor faults	Level 2	9
Elective	120238	Collate and shrink-wrap packaged products using automatad wraooina eouioment	Level 2	6
Elective	246482	Control the activities of a small chemical manufacturing business	Level 2	6
Elective	114639	Control waste or effluent water in a manufacturing environment	Level 2	4
Elective	14804	Demonstrate knowledge of Good Manufacturing Practices in a Chemical Manufacturina enviroment	Level 2	6
Elective	244078	Demonstrate understandina of a work permit system	Level 2	3
Elective	119666	Determine financial reouirements of a new venture	Level 2	8
Elective	119673	Identify and demonstrate entrepreneurial ideas and oooortunities	Level 2	7
Elective	9599	Lift and move material and equipment by means of a forklift	Level 2	3
Elective	246478	Maintain the integrity of a sensitive manufacturing environment	Level 2	6
Elective	244075	Maintain the quality of products in a production environment	Level 2	5
Elective	119668	Manaae business operations	Level 2	8
Elective	119674	Manaae finances for a new venture	Level 2	10
Elective	119672	Manage marketing and selling processes of a new venture	Level 2	7
Elective	116235	Operate a pendant controlled overhead crane	Level 2	5
Elective	242981	Operate defined purpose lift trucks	Level 2	4
Elective	12207	Operate moving equipment to stack, de-stack and position materials	Level 2	4
Elective	246477	Package manufactured products using an automated or semi-automated packaging machine	Level 2	6
Elective	114936	Participate effectivelv in a team or arouo	Level 2	2
Elective	246476	Produce formulated industrial and consumer oroducts	Level 2	10
Elective	119744	Select use and care for engineering hand tools	Level 2	8
Elective	110299	Transfer bulk solids	Level 2	4
Elective	113877	Understand fundamentals of electricity	Level 2	8
Elective	*244081*	Understand the properties and applications of materials in a processinc environment.	Level 2	5
Elective	116937	Use a Graphical User Interface (GUI)-based spreadsheet aoolication to create and edit soreadsheets	Level 2	4
Elective	117924	Use a Graphical User Interface (GUI)-based word orocessor to format documents	Level 2	5
Elective	9322	Work in a team	Level 2	3
Elective	119558	Work with, use and care for materials and resources which can imoacl on health and the environment	Level 2	10
Elective	244095	Dismantle. assemble and install basic components in a process environment	Level 3	6

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	116714	Lead a team, Dian allocate and assess their work	Level 3	4
Elective	120239	Monitor critical control points (CCPs) as an integral part of a hazard analysis critical control point (HACCP) system	Level 3	6
Elective	244094	Perform and suoport maintenance functions	Level 3	5
Elective	14774	Prepare batches of material using an integrated batch mixing plant	Level 3	20
Elective	116970	Manage the disposal of effluents, solids and sludge from a wastewater treatment works in terms of relevant legislation and guidelines	Level 5	5
Fundamental	119463	Access and use information from texts	Level 2	5
Fundamental	9009	Apply basic knowledge of statistics and probability to Influence the use of data and procedures in order to investigate life related problems	Level 2	3
Fundamental	7480	Demonstrate understanding of rational and irrational numbers and number systems	Level 2	3
Fundamental	9008	Identify, describe, compare, classify, explore shape and motion in 2-and 3-dimensional shapes in different contexts	Level 2	3
Fundamental	119454	Maintain and adapt oral/spoken communication	Level 2	5
Fundamental	119460	Use language and communication in occupational learning programmes	Level 2	5
Fundamental	7469	Use mathematics to investigate and monitor the financial aspects of personal and community life	Level 2	2
Fundamental	9007	Work with a range of patterns and functions and solve problems	Level 2	5
Fundamental	119456	Write/Present for a defined context	Level 2	5

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of process plant technology

SAQA USID	***UNIT STANDARD TITLE***		
246474	Demonstrate understanding of process plant technology		
ORIGINATOR		***PROVIDER***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - Manufacturine, Engineerina and Technolcov		Eneineering and Related Design	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 2	10

SPECIFIC OUTCOME 1
Explain the fundamental principles of the process.

SPECIFIC OUTCOME 2
Explain the properties of the raw material(s) used in the process.

SPECIFIC OUTCOME 3
Explain the properties of the final product(s) and by-product(s) produced in this process.

SPECIFIC OUTCOME 4
Describe additional mechanical equipment, electrical equipment, instrumentation and utilities used in the production process.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Produce formulated industrial and consumer products

SAQA USID	***UNIT STANDARD TITLE***		
246476	Produce formulated industrial and consumer products		
ORIGINATOR		***PROVIDER***	
Chemical Industries 8GB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technolocv		Engineerina and Related Design	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 2	10

SPECIFIC OUTCOME 1
Identify and list the properties of the different raw materials used in the manufacturing process.

SPECIFIC OUTCOME 2
Identify and list the properties of the product to be manufactured on the production line.

SPECIFIC OUTCOME 3
Explain the manufacturing process used to produce a formulated product.

SPECIFIC OUTCOME 4
Produce formulated industrial or consumer products in a manufacturing process.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Package manufactured products using an automated or semi-automated packaging machine

SAQA USID	***UNIT STANDARD TITLE***		
246477	Package manufactured products using an automated or semi-automated oackaaina machine		
ORIGINATOR		***PROVIDER***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 2	16

SPECIFIC OUTCOME 1
Understand the fundamentals of a packaging machine.

SPECIFIC OUTCOME 2
Run a packaging machine.

SPECIFIC OUTCOME 3
Monitor and control the performance of the packaging machine.

SPECIFIC OUTCOME 4
Maintain the integrity of the work environment.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Maintain the integrity of a sensitive manufacturing environment

SAQA USID	*UNIT STANDARD TITLE*		
246478	Maintain the integrity of a sensitive manufacturing environment		
ORIGINATOR		*PROVIDER*	
Chemical Industries 5GB			
FIELD		*SUBFIELD*	
6 - Manufacturina. Enaineerina and Technoloav		Enaineerina and Related Desion	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Regular	Level 2	16

SPECIFIC OUTCOME 1
Apply general health and hygiene procedures applicable to a sensitive manufacturing environment.

SPECIFIC OUTCOME 2
Apply environmental monitoring and control procedures applicable to a sensitive manufacturing environment.

SPECIFIC OUTCOME 3
Apply internal and external contamination control procedures applicable to a sensitive manufacturing environment.

SPECIFIC OUTCOME 4
Apply aseptic techniques during the handling and storage of materials.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Monitor and control product parameters In a manufacturing environment

SAQA USID	***UNIT STANDARD TITLE***		
246479	Monitor and control product parameters in a manufacturing environment		
ORIGINATOR		***PROVIDER***	
Chemical Industries SGB			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerino and Technoloav		Manufacturino and Assemblv	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 2	15

SPECIFIC OUTCOME 1
Demonstrate an understanding of monitoring product parameters in a manufacturing environment.

SPECIFIC OUTCOME 2
Assess product suitability by means of measurements, checks and simple tests.

SPECIFIC OUTCOME 3
Plot values and compare these values against maximum/minimum control limits.

SPECIFIC OUTCOME 4
Take corrective action pertaining to measured values, checks and tests.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Control the activities of a small chemical manufacturing business

SAQA USID	*UNIT STANDARD TITLE*		
246482	Control the activities of a small chemical manufacturing business		
ORIGINATOR		*PROVIDER*	
Chemical Industries 8GB			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Engineerina and Related Desion	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	16

SPECIFIC OUTCOME 1
Draw up a budgetary framework.

SPECIFIC OUTCOME 2
Develop a budgetary framework for manufacturing chemical products.

SPECIFIC OUTCOME 3
Develop a budget for manufacturing chemical products.

SPECIFIC OUTCOME 4
Monitor and control the production progress against the production targets stated in the budget,

No. 725 17 August 2007

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Manufacturing and Assembly Processes

registered by Organising Field 06 - Manufacturing, Engineering and Technology, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles; fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saqa.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and no *later than* 17 *September 2007.* All correspondence should be marked Standards Setting - Manufacturing and Assembly Processes and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 -431-5144
e-mail: dmphuthing@saqa.org.za

DRS BHIKHA
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Certificate" Fluid Power

SAQA QUALID	*QUALIFICATION TITLE*		
58883	National Certificate: Fluid Power		
ORIGINATOR		*PROVIDER*	
8GB Manufacturina and Assemblv Processes			
QUAL/FICATION TYPE	*FIELD*	*SUBFIELD*	
National Certificate	6 - Manufacturing, Engineering and Technologv	Manufacturing and Assembly	
ABET BAND	*MINIMUM CREDITS*	*NQFLEVEL*	*QUAL* CLASS
Undefined	129	Level 5	Regular-Unit Stds Based

PURPOSE OF *THE QUAL/FICATION*
Purpose:

The purpose of this qualification is to provide learners with the standards and range of learning required to work effectively in the fluid power environment, making use of the relevant skills and knowledge to design either hydraulic or integrated electro-pneumatic circuits.

This is the fourth qualification in a series for learners who would like to follow a career in fluid power and focuses on specialising skills in testing designing and integrating systems. This qualification builds on the learning undertaken in the National Further Education and Training Certificate in fluid power at NQF Level 4, and it is assumed that learners entering into a learning programme towards this qualification are already competent in the core skills outlined in the NQF Level 4 qualification in either hydraulics or pneumatics. This qualification follows on from the specialisation streams elected at NQF Level 4.

With this additional learning, learners will be able to design either a hydraulic system or an integrated electro-pneumatic circuit. What learners achieve in this qualification will also serve as a basis for further learning where they may undertake more technical/earning towards a National Diploma in engineering technology at NQF Level 6.

On completion of this qualification, the learner will be given recognition for the following exit level outcomes:

- Communicate design requirements with clients and team members.
- Design a fluid power system to meet client requirements.
- o Range: Either hydraulic or electro-pneumatic, depending on area of specialisation.

These capabilities require an understanding of electrical theory and fluid power principles, physics, concepts of measurement, engineering drawings and circuit diagrams. Lateral thinking and technical calculations play an important role in this qualification.

Qualifying learners will be able to relate what they are doing to scientific and technological principles and concepts. They will also be able to maintain and support the various policies and procedures related to the safety, health, environment and quality systems that govern their workplace.

Rationale:

Industry is characterised by technologically sophisticated automation processes using systems that integrate the fields of mechanical, electrical engineering and fluid power. The field of fluid power deals with the assembly, installation, commissioning and maintenance of such systems that conform to all safety aspects as per regulations and legislation. People working in the fluid power field require specialised technical skills and knowledge as well as highly developed hand skills to enable them to achieve these requirements.

This is the fourth qualification in a series for learners who want to follow a career in fluid power. This series reflects the skills, knowledge and understanding required to perfonm effectively in industry, whether in micro, small, medium or large enterprises. This qualification makes allowance for a split between designing hydraulic and integrated electro-pneumatic systems.

There is a need for this qualification in the industry because many people who are able to test and repair fluid power circuits in a given context would like to advance their skills onto more complex activities and start designing hydraulic or electro-pneumatic circuits.

This qualification builds on the NQF Level 4 qualification and forms a basis for further learning in the field of engineering design, both at NQF Level 5 and higher.

People who have achieved the skills and knowledge outlined in this qualification are normally employed in the follOWing positions:

- Hydraulic system supervisor.
- Pneumatic system supervisor.
- Chief engineer.
- Quality controller.
- Fluid power designer.

There are currently approximately 100 people employed in the industry that are required to make up fluid power circuits as would be learnt through this qualification. This implies that many learners will be able to be given Recognition of Prior Learning (RPL) for one or more unit standards making up this qualification, and that the qualification is required by industry. For those who have been in the workplace for a long time, this qualification represents part of the RPL process that acknowledges workplace skills acquired without the benefit of formal education and training.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
It is assumed that learners entering a programme towards this qualification have achieved a fluid power NQF Level 4 qualification in either hydraulics or pneumatics, or have the relevant experience.

Recognition of Previous Learning:

This qualification may be obtained through the process of RPL. The learner should be thoroughly briefed prior to the assessment and support provided to assist in the process of developing a portfolio. While this is primarily a work-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the exit level outcomes.

Access to the Qualification:

This qualification recognises the skills, knowledge and values relevant in the workplace and will cater for learners who:

• Have attended courses and need to apply the knowledge gained to activities in the workplace.
• Are already workers and have acquired skills and knowledge without having attended formal training.
• Are part of a learnership program which integrates structured learning and operational experience.

Candidates applying for this qualification need to demonstrate physical competence in operating equipment and should therefore be physically able to contend with the circumstances required in the workshop environment. Access for learners with physical disabilities is dependant on the following:

• Type and severity of disability.
• The nature of the process and requirements of equipment operation.

QUALIFICATION RULES

This qualification consists of a minimum of 129 credits made up as follows:

• Candidates are required to achieve all 38 credits from the fundamental unit standards.
• Candidates must achieve all 47 credits from the core unit standards.
Plus
• All 27 credits from the selected specialisation stream (either hydraulic or electro-pneumatic).
• Candidates may select additional unit standards from any of the elective unit standards to achieve a minimum of 17 credits.

Note: The elective credits should be chosen in accordance with the requirements of the selected context and the interests of the learner.

EXIT LEVEL OUTCOMES

The exit level outcomes for this qualification reflect a combination of specific outcomes and critical cross-field education and training outcomes. The way in which the critical cross-field outcomes have been advanced through the learning required for this qualification is embedded in the way in which the unit standards have been constructed. Critical cross-field outcomes form the basis of acquiring the skills, knowledge and values acquired through achievement of this qualification. The application of these cross-field outcomes in a specific context results in the achievement of specific outcomes. The integration of specific outcomes from a variety of unit standards results in the ability to achieve the exit level outcomes.

1. Communicate design requirements with clients and team members.

2. Explain and apply the knowledge of fluid power design.

3. Work as a team member.

4. Design a fluid power system to meet client requirements.
• Range: Includes hydraulic or electro-pneumatic circuts.

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria Exit Level Outcomes 1:

1.1 Communication with clients and team members is clear and concise.
1.2 Communication is relevant to the context of the client.
1.3 Techniques selected for communication are relevant to the situation.
1.4 Techniques are used effectively to transfer information.
1.5 Understanding of design requirements are confirmed in accordance with organisational procedures.

Associated Assessment Criteria Exit Level Outcomes 2:

2.1 Design information is gathered in accordance with set standards.
2.2 Physics principles are explained and applied in relation to fluid power.
2.3 Fluid mechanics are described in terms of engineering principles.
2.4 Calculations are conducted to the required degree of accuracy.
2.5 Functionality of the fluid power system is explained with examples.

Associated Assessment Criteria Exit Level Outcomes 3:

3.1 The criteria for working as a member of a team are described and demonstrated in accordance with workplace requirements.
3.2 Work is conducted autonomously and in collaboration with other team members.
3.3 Relationships between team members and stake holders are build to enhance maximum co-operation.
3.4 Positive contributions to team coherence, image and spirit are made.
3.5 Personal, ethical, religious and cultural differences are respected to enhance interaction between team members.

Associated Assessment Criteria Exit Level Outcomes 4:

4.1 Client system requirements are confirmed in accordance with organisational procedures.
4.2 Various options of components that will meet the requirements are analysed and prioritised in terms of effectiveness, reliability and cost.
4.3 Sizes and types of components selected are justified from given requirements and manufacturer output specifications.
4.4 Fluid power and electronic control systems are integrated in the design where required.
4.5 Designed systems are pilot tested to ensure suitability to customer requirements.

Integrated Assessment:

The integrated assessment must be based on a summative assessment guide. The guide must indicate how the assessor will assess different aspects of the performance and will include:

- Observing the learner at work (in primary activities as well as in other interactions) or by relevant simulations.
- Asking questions and initiating short discussions to test understanding.
- Evaluating records and reports.

While this is primarily a workplace-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the exit level outcomes.

The assessment process should cover both the explicit tasks required for the qualification as well as the understanding of the concepts and principles that underpin the activities required of fluid power. The assessment process should also establish how the critical outcomes have been advanced by the learning process.

INTERNATIONAL COMPARABIUTY

Fluid Power companies in South Africa are mostly representative of, or affiliated to, international counterparts. Work standards are benchmarked against international best practices, and these practices were used as the basis for compiling unit standards. Major global industry players have contributed to the process of establishing appropriate standards and international comparability. This qualification was compared to similar outcomes-based qualifications in various countries as follows:

Australia:

Australia was chosen because its fluid power industry is service-based, similar to South Africa with mining, construction, fishing, agriculture, pulp and paper, automotive and off-shore industry activities that make use of fluid power systems.

The Australian National Training Authority have developed standards in fluid power that are incorporated into qualifications such as "printing and graphic arts", "automotive industry manufacturing" and "pulp and paper manufacturing", whereas this qualification is directed towards a trade in fluid power. This qualification is similar to the Australian qualification in that they both:

• Set forth standards for competency based learning and assessment directly related to the workplace.
• Outline assessment standards along with assessor qualifications,
• Require a balanced approach to the qualifications which include application and conceptual understanding of basic principles.
• Include the availability/process for RPL.
• Include unit standards.

This qualification differs from the Australian qualification in that:

• It is specific to fluid power as an individual qualification. The Australian system uses individual Units of Competence regarding pneumatics and hydraulics which form part of engineering certificates.
• The South African unit standards are more detailed and specific, with progression to different levels.
• Training towards the competencies identified in this qualification are only done at university as part of an engineering degree.

United States of America:

America was chosen for comparison because they are the world's largest producer of fluid power components, with 2 of the largest manufacturing companies in the world (Parker and Eaton) having their corporate headquarters situated in Cleveland, Ohio, These companies have global manufacturing facilities and are represented in South Africa.

There are no mandated national standards for training fluid power technicians in the USA, however, ANSI/FPS/CS 1 specifies the testing procedures for the following career paths:

• Fluid power mechanic (as defined by the U,S. Department of Labour DOT 600.281-010).
• Fluid power technician (as defined by the U.S. Department of Labour DOT 007.161-026).
• Fluid power specialist (as defined by the U.S. Department of Labour DOT 007.061-014).
• Fluid power engineer.

Testing is conducted under the auspices of the Fluid Power Certification Board which shall be representative of manufacturers, distributors, users, educators and general interest groups, with no single category being in the majority. Written and practical tests are prepared by qualified fluid power professionals Who are approved by the Fluid Power Certification Board.

This qualification is similar to the USA standards in that they both:

• Do not specify training requirements, but identify assessment criteria for competent performance at different levels in fluid power.
• Are specific to fluid power as an individual qualification.

This qualification differs from the USA standards in that:

• They do not have registered unit standards, but give broad requirements of competence, which are set by industry.
• There are no clear guidelines for progression from one qualification to another.
• The employers are responsible for determining levels of competence, except for the Fluid Power Engineer, who will be certified by the universities and state licensing boards.
• Certification is only valid for a period of 5 years, as specified by the Fluid Power Certification Board.
• Training towards the competencies identified in this qualification are only done at university as part of an engineering degree.

Japan:

Japan was selected for comparison because they are home to the largest pneumatic manufacturing company in the world. They also have a large original equipment manufacturer's market using pneumatic components for global distribution.

Japan has a National Trade Skill Test system which is certified by the government to test the technical skills and knowledge of working people according to uniform standards. This started in 1959 with five specific trades, and was expanded to 137 trades in 2004, including "Pneumatic circuits and apparatus devices assembling" and "Hydraulic systems". The National Trade Skill Test takes place annually and the applicants must take practical and theoretical tests. Upon passing the examination, the Minister of Health, Labour and Welfare or Prefectural Governor issues the successful applicants a diploma and a "Certified Skilled Worker" award.

The results of the National Trade Skill Tests may be graded as follows:

• Advanced grade Skills required for managers and supervisors.
• 1st grade or non-classified grade Skills required for advanced skilled workers.
• 2nd grade Skills required for intermediate skilled workers.
• 3rd grade Skills required for novice workers.

The course content was not available in English and therefore could not be evaluated in detail for comparison.

Germany:

Germany was selected for comparison because they are a major producer of fluid power components and systems and are home to, amongst others, the following companies that are represented in South Africa: Festo, Bosch Rexroth, Norgren-Herion, Parker Ermeto, Walterscheidt, Voss and Burkert. Major innovations in hydraulics stem from Germany and are practically applied in South Africa.

It was identified that Germany does not offer qualifications specific to fluid power, but that they do offer generic mechanical qualifications with courses in hydraulics or pneumatics in agricultural, industrial and automotive fields. These are generally conducted through industry based apprenticeship training with duration of 42 months, which may be shortened to as little as 2 years, depending on prior learning. Assessments for these trades are undertaken by the Regional "Industrie und Handelskammer".

Specialised courses are offered by employers to train candidates to industry requirements. Much of this training material has been adopted by South African companies in their training courses. Elements of the MERSETA accredited course in mechatronics is presented by Festo, and most of the training material for that qualification is from Germany.

Africa:

It was identified that Botswana, Zimbabwe, Zambia, Namibia, Swaziland, Mauritius and Malawi do not have specific qualifications in fluid power, but most generic engineering qualifications contain courses in pneumatics and hydraulics. International companies and local mining houses represented in those countries provide short courses to equip candidates with specific skills required for areas of involvement. Generally a tradesman (fitter & turner, maintenance technicians, etc.) is employed to conduct machine maintenance, which includes various . elements of fluid power. The design element that is covered in this qualification is normally undertaken by qualified engineers.

ARTICULATION OPTIONS

This qualification has been designed and structured as part of a progressive route in the manufacturing and assembly processes industry so that qualifying learners can move from one level to the next. Employers or institutions should be able to evaluate the outcomes of this qualification against the needs of their context and structure top-up learning appropriately. Equally, holders of other qualifications may be evaluated against this qualification for the purpose of RPL. The use of generic unit standards in this qualification opens new avenues for the learner to progress from one qualification to another in related fields of study beyond fluid power.

This qualification leads on from the National Further Education and Training Certificate in Fluid Power: NQF Level 4 and opens avenues of learning in engineering design at NQF Level 5 and above. The use of generic unit standards in the qualification also ensures that a learner will not be trapped into a specific context, but may use the unit standards achieved as stepping stones to additional qualifications in engineering. Learners may also decide to further their career in one of the following fields:

- Electrical engineering.
- Mechanical engineering.
- Electrical and mechanical design.

Learners who have achieved this qualification will have achieved generic skills that will enable them to follow a career in electrical or mechanical engineering. This qualification articulates with the following qualifications:

- ID 49745: National Certificate: Value Engineering (NQF Level 5).
- ID 49744: National Diploma: Engineering Technology (NQF Level 6).

MODERATION OPTIONS

Moderators for the qualification should be qualified and accredited with an appropriate ETQA and have a suitable qualification in engineering with a minimum of 5 years experience in fluid power.

To assure the quality of the assessment process, the moderation should cover at least one of the following:

- Assessor credentials.
- The assessment instrument.
- The assessment process.

Where assessment and moderation are taking place in sectors other than the MERSETA, assessment and moderation should be in terms of a memorandum of understanding negotiated with the MERS ETQA.

***CRITERIA FOR THE REG/STRA TION* OF ASSESSORS**

1. Appropriate qualification in the field of engineering, with a minimum of 5 years experience in the field of fluid power. The subject matter experience of the assessor can be established by recognition of prior learning.

2. Appropriate experience and understanding of assessment theory, processes and practices.

3. Good interpersonal skills and ability to balance the conflicting requirements of:

- Maintaining national standards.
- The interests of the learner.
- The need for transformation and redressing the legacies of the past.
- The cultural background and language of the learner.

4. Registration as an assessor with the relevant ETQA.

5. Any other criteria required by the relevant ETQA.

NOTES
N/A

UNIT STANDARDS

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	14057	Demonstrate knowledge and understanding of electrical systems and related concepts	Level 4	6
Core	120372	Exolain fundamentals of project management	Level 4	5
Core	114599	Aoolv Functional Value to Enaineerina Desian	Level 5	6
Core	116790	Commission machines and equipment or pilot and test a new technical service	Level 5	10
Core	140S3	Demonstrate knowledae of corrosion control	Level 5	7
Core	244708	Demonstrate knowledoe of fluid mechanics	Level 5	6
Core	244698	Demonstrate knOWledge of integrating hydraulic systems to applications	Level 5	4
Core	244706	Demonstrate knowledoe of ehvslcsrelevant to fluid DOwer	Level 5	10
Core	244684	Desion hvdraulic svstems	Level 5	11
Core	244700	Desion integrated electro-pneumatic svsterns	Level 5	15
Core	244695	Desion proportional nveraunc systems	Level 5	5
Core	244687	Determine hydraulic pipe sizes	Level 5	4
Core	244693	Develop pneumatic and electro-mechanical positioning systems	Level 5	6
Core	244689	Inteorate and maintain electro-pneumatic systems	LevelS	6
Elective	14473	Develoo and produce com outer aided drawinas	Level 4	4
Elective	9405	Analyse work reouirements and plan ahead	LevelS	4
Elective	120310	Apply client service techniques to improve service deliverv	Level 5	6
Elective	120303	Aoolv orinciples of risk manaaement	Level 5	8
Elective	1S216	Create opportunities for innovation and lead projects to meet innovative ideas	Level 5	4
Elective	12458	Develop the skills of a work team	Level 5	10
Elective	13256	Maintain business processes	LevelS	10
Elective	9406	Manaoe a team	Level 5	4
Elective	12459	Optimise the safety, health and environmental protection svstem	Level 5	6
Elective	114885	Prepare and communicate a productivity improvement olan for a functional unit	Level 5	6
Elective	12311	Train customers on new and/or enhanced oroducts	Level 5	16
Fundamental	9407	Communicate with clients and discuss work	Level 5	5
Fundamental	115823	Gather and manaoe information for decision-makina	Level 5	5
Fundamental	12433	Use communication technioues effectivelv	Level 5	8
Fundamental	12432	Use mathematical and statistical technioues effectivelY	Leyel5	20

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Design hydraulic systems

SAQA USID	***UNIT STANDARD TITLE***		
244684	Desion hydraulic svsterns		
ORIGINATOR		***PROVIDER***	
SGB Manufacturina and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturino, Enoineerino and Technoloav		Manufacturina and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Leyel5	11

SPECIFIC OUTCOME 1
Determine hydraulic system specifications.

SPECIFIC OUTCOME 2
Select actuator components.

SPECIFIC OUTCOME 3
Select control valves and specify control philosophy for a hydraulic system.

SPECIFIC OUTCOME 4
Design a hydraulic power unit.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Determine hydraulic pipe sizes

SAQA USID	*UNIT STANDARD TITLE*		
244687	Determine hydraulic oloe sizes		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing. Engineering and Technology		Manufacturina and AssemblY	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Regular	Leyel5	14

SPECIFIC OUTCOME 1
Determine the inside diameter of a pipe required for a hydraulic system.

SPECIFIC OUTCOME 2
Select material for a hydraulic pipe.

SPECIFIC OUTCOME 3
Determine required wall thickness of a pipe.

SPECIFIC OUTCOME 4
Demonstrate understanding of different connectors used in a pipe installation.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Integrate and maintain electro-pneumatic systems

SAQA USID	***UNIT STANDARD TITLE***		
244689	Integrate and maintain electro-pneumatic systems		
ORIGINATOR		***PROVIDER***	
8GB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, EnQineerinQ and Technoloqv		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 5	16

SPECIFIC bUTCOME 1
Assemble an integrated electro-pneumatic system.

SPECIFIC OUTCOME 2
Commission an integrated electro-pneumatic system.

SPECIFIC OUtCOME 3
Optimise an integrated electro-pneumatic system.

SPECIFIC OUTCOME 4
Maintain an integrated electro-pneumatic system.

SOUTH,AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Develop pneumatic and electro-mechanical positioning systems

SAQA USID	***UNIT STANDARD TITLE***		
244693	Develop pneumatic and electro-mechanical positioning systems		
ORIGINATOR		***PROVIDER***	
SGB Manufacturino and Assemblv Processes			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enoineerina and Technoloov		Manufaeturino and Assemblv	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 5	16

SPECIFIC OUTCOME 1
Demonstrate an understanding of the fundamentals of positioning system design.

SPECIFIC OUTCOME 2
Select positioning components.

SPECIFIC OUTCOME 3
Install positioning components.

SPECIFIC OUTCOME 4
Commission positioning systems.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Design proportional hydraulic systems

SAQA USID	***UNIT STANDARD TITLE***		
244695	Design proportional hydraulic S\ stems		
ORIGINATOR		***PROVIDER***	
SGB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, Enaineerina and Technoloov		Manufacturina and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	LevelS	15

SPECIFIC OUTCOME 1
Demonstrate understanding of proportional valves.

SPECIFIC OUTCOME 2
Explain the different types of proportional valves.

SPECIFIC OUTCOME 3
Select proportional valves for a given application.

SPECIFIC OUTCOME 4
Integrate electronics and the proportional valve in a hydraulic system.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate knowledge of integrating hydraulic systems to applications

SAQA USID	***UNIT STANDARD TITLE***		
244698	Demonstrate knowledae of intec ratina hvdraulic svstems **to** aoollcations		
ORIGINATOR		***PROVIDER***	
8GB Manufacturing and Assemblv Processes			
FIELD		***SUBFIELD***	
6 - ManufactUring, Engineering and Technology		Manufacturing and Assemblv	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	LevelS	14

SPECIFIC OUTCOME 1
Demonstrate understanding of hydraulic applications.

SPECIFIC OUTCOME 2
Analyse hydraulic system requirements for a specified application.

SPECIFIC OUTCOME 3
Analyse safety aspects of various hydraulic applications.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Design integrated electro-pneumatic systems

SAQA USID	*UNIT STANDARD TITLE*		
244700	Design Intecrated electro-pneumatic systems		
ORIGINATOR		*PROVIDER*	
5GB Manufacturina and Assemblv Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	ReQular	Level 5	15

SPECIFIC OUTCOME 1
Demonstrate knowledge of integrated electro-pneumatic systems.

SPECIFIC OUTCOME 2
Determine resources for system requirements.

SPECIFIC OUTCOME 3
Analyse safety aspects of various electro-pneumatic applications.

SPECIFIC OUTCOME 4
Design electro-pneumatic systems.

SPECIFIC OUTCOME 5
Develop control logic to run the application.

SPECIFIC OUTCOME 6
Select and configure a communication system.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate knowledge of physics relevant to fluid power

SAQA USID	***UNIT STANDARD TITLE***		
244706	1Demonstrate knowledae of physics relevant to fluid power		
ORIGINATOR		***PROVIDER***	
5GB ManufacturinQ and Assembly Processes			
FIELD		***SUBFIELD***	
6 - ManufacturinQ, Enaineerina and Technoloqv		ManufacturinQ and Assemblv	
ABETBAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 5	110

SPECIFIC OUTCOME 1
Demonstrate knowledge of forces, velocities and acceleration.

SPECIFIC OUTCOME 2
Demonstrate knowledge of the relationship between work, energy and power in fluid power applications.

SPECIFIC OUTCOME 3
Demonstrate knowledge of the relationship between pressure, volume and temperature in ideal gases.

SPECIFIC OUTCOME 4
Demonstrate knowledge of energy transfer in fluid power systems.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate knowledge of fluid mechanics

SAQA USID	*UNIT STANDARD TITLE*		
244708	Demonstrate knowledae of fluid mechanics		
ORIGINATOR		*PROVIDER*	
8GB ManufacturinQ and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturina, Enaineerina and Technoloqv		Manutacturlno and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	1Reaular	LevelS	16

SPECIFIC OUTCOME 1
Demonstrate knowledge of forces and pressures within a fluid.

SPECIFIC OUTCOME 2
Demonstrate understanding of viscosity and fluid flow.

SPECIFIC OUTCOME 3
Demonstrate knowledge of pressure, mass flow and velocity of dynamic fluids within fluid conveyances.

No. 726 17 August 2007

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Manufacturing and Assembly Processes

registered by Organising Field 06 - Manufacturing, Engineering and Technology, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saga.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and no *later than* 17 *September 2007.* All correspondence should be marked Standards Setting - Manufacturing and Assembly Processes and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 - 431-5144
e-mail: dmphuthing@saqa.org.za

DRS BHIKHA
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATiON:
Further Education and Trainma Certtf/cate: Fiu;dPower

SAQA QUALID	*QUAL/FICATION TITLE*		
58880	Further Education and Training Certificate: Fluid Power		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
Further Ed and Training Cert	6 - Manufacturing, Engineering and Technologv	Manufacturing and Assembly	
ABET BAND	*MINIMUM CREDITS*	*NQFLEVEL*	*QUAL CLASS*
Undefined	*160*	Level 4	Regular-Unit Stds Based

PURPOSE OF *THE QUALIFICATION*
Purpose:

The purpose of this qualification is to provide learners with the standards and range of learning required to work effectively in the fluid power environment, making use of the relevant skills and knowledge to specialise in testing and repair of either hydraulic or pneumatic circuits.

This is the third qualification in a series for learners who would like to follow a career in fluid power and focuses on specialising skills in testing and repairing fluid power systems. This qualification builds on the learning undertaken in the National Certificate in fluid power at NQF Level 3, and it is assumed that learners entering into a learning programme towards this qualification are already competent in the core skills outlined in the NQF Level 3 qualification. This qualification caters for learners who choose to specialise in either hydraulics or pneumatics and is split into two elective streams.

With this additional learning, learners will be able to test and repair either hydraulic or pneumatic systems, depending on their area of specialisation. What learners achieve in this qualification will also serve as a basis for further learning where they will engage in more complex activities in designing and integrating fluid power circuits at NQF Level 5.

On completion of this qualification, the learner will be given recognition for the following exit level outcomes:

- Work as a member of a project team.
- Test a fluid power system.
- o Range: Either hydraulic or pneumatic, depending on area of specialisation.
- Repair a fluid power system.
- a Range: Either hydraulic or pneumatic, depending on area of specialisation.
- Design a simple pneumatic circuit.

Rationale:

Industry is characterised by technologically sophisticated automation processes using systems that integrate the fields of mechanical, electrical engineering and fluid power. The field of fluid power deals with the assembly, installation, commissioning and maintenance of such systems that conform to all safety aspects as per regulations and legislation. People working in the fluid

power field require specialised technical skills and knowledge as well as highly developed hand skills to enable them to achieve these requirements.

This is the third qualification in a series for learners who want to follow a career in fluid power. This series reflects the skills, knowledge and understanding required to perform effectively in industry, whether in micro, small, medium or large enterprises. This qualification makes allowance for a split between hydraulics and pneumatics and focuses on the skills required to install, test and repair components, as well as developing designing skills.

There is a need for this qualification in the industry because many people who are able to make up fluid power circuits in a given context would like to advance their skills onto more complex activities and start testing and repairing either hydraulic or pneumatic circuits.

People who have achieved the skills and knowledge outlined in this qualification are normally employed in the following positions:

- Hydraulic system supervisor.
- Pneumatic system supervisor.
- Quality controller.
- Hydraulic fitter.
- Pneumatic fitter.
- Pneumatic system designer.
- Project manager.
- FP pump repairer.

Leamers may advance from these positions to achieve the qualification in fluid power at NQF Level 5 where they will be required to design more complex hydraulic circuits as necessary.

There are currently approximately 300 people employed in the industry that are required to make up fluid power circuits as would be learnt through this qualification. This implies that many learners will be able to be given Recognition of Prior Learning (RPL) for one or more unit standards making up this qualification, and that the qualification is required by industry. For those who have been in the workplace for a long time, this qualification represents part of the RPL process that acknowledges workplace skills acquired without the benefit of formal education and training.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
It is assumed that leamers entering a programme towards this qualification have achieved a fluid power NQF Level 3 qualification or have the relevant experience.

Recognition of Prior Learning:

This qualification may be obtained through the process of RPL. The learner should be thoroughly briefed prior to the assessment and support provided to assist in the process of developing a portfolio. While this is primarily a work-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the exit level outcomes.

Access to the Qualification:

This qualification recognises the skills, knowledge and values relevant in the workplace and will cater for learners who:

- Have attended courses and need to apply the knowledge gained to activities in the workplace.

• Are already workers and have acquired skills and knowledge without having attended formal training.
• Are part of a learnership program which integrates structured learning and operational experience.

Candidates applying for this qualification need to demonstrate physical competence in operating equipment and should therefore be physically able to contend with the circumstances required in the workshop environment. Access for learners with physical disabilities is dependant on the following:

• Type and severity of disability.
• The nature of the process and requirements of equipment operation.

QUALIFICATION RULES
This qualification consists of a minimum of 160 credits made up as follows:

• Candidates are required to achieve all 40 credits for communication from the available fundamental unit standards.
• Candidates are required to achieve all 16 credits for mathematical literacy within the context of electro-mechanical winding operations.
• Candidates must achieve all 42 credits from the core unit standards.
• All 47 credits from the selected specialisation stream (either hydraulic or pneumatic).
• Candidates may select additional unit standards from any of the elective unit standards to achieve a minimum of 15 credits.

Note: The elective credits should be chosen in accordance with the requirements of the selected context and the interests of the learner.

EXIT LEVEL OUTCOMES
The exit level outcomes for this qualification reflect a combination of specific outcomes and critical cross-field education and training outcomes. The way in which the critical cross-field outcomes have been advanced through the learning required for this qualification is embedded in the way in which the unit standards have been constructed. Critical cross-field outcomes form the basis of acquiring the skills, knOWledge and values acquired through achievement of this qualification. The application of these cross-field outcomes in a specific context results in the achievement of specific outcomes. The integration of specific outcomes from a variety of unit standards results in the ability to achieve the exit level outcomes.

1. Work as a member of a project team.

2. Test a fluid power system.
o Range: Either hydraulic or pneumatic, depending on area of specialisation.

3. Repair a fluid power system.
o Range: Either hydraulic or pneumatic, depending on area of specialisation.

4. Design a simple pneumatic circuit.

ASSOCIATED ASSESSMENT CRITERIA
Associated Assessment Criteria for Exit Level Outcome 1.

1.1 Communication is maintained and adapted as required to promote effective interaction in a work context.
1.2 Work outputs facilitate effective achievement of group goals.
1.3 Personal relations are developed to maximise team output.
1.4 Positive contributions to team coherence, image and spirit are made.

1.5 Responsibilities of different team members and the impact of poor workmanship in any area are explained in terms of the team output.
1.6 Personal, ethical, religious and cultural differences are respected to enhance interaction between team members.

Associated Assessment Criteria for Exit Level Outcome 2.

2.1 Test equipment is set up and operated in accordance with manufacturer specifications.
2.2 Components to be tested are identified from work instructions.
2.3 Consequences of testing incorrect components are explained in terms of work schedules and customer satisfaction.
2.4 Test results are interpreted to give an indication of the status of the entire system.
2.5 Test reports are completed in accordance with organisation requirements.

Associated Assessment Criteria for Exit Level Outcome 3.

3.1 Faults are identified that will prevent the component operating as required.
3.2 Potential methods of repairing the fault are identified and explained in terms of the procedure and expected result of repair.
3.3 The most suitable repair method is selected and applied to ensure compliance of the component with manufacturer specifications.
3.4 The repair is conducted in accordance with accepted timeframes and with minimum wastage.
3.5 Faults identified are rectified and the system is tested to ensure functionality.

Associated Assessment Criteria for Exit Level Outcome 4.

4.1 The number and type of components required are identified from given drawings and specifications.
4.2 Components are selected that are appropriate to the required application.
4.3 The size of pipes and tubes is appropriate to the required flow speed and pressure.
4.4 The circuit sequence is appropriate to the given requirements.
4.5 The circuit functions and components are mapped out in suitable graphical diagrams.

Integrated Assessment:

The integrated assessment must be based on a summative assessment guide. The guide must indicate how the assessor will assess different aspects of the performance and will include:

- Observing the learner at work (in primary activities as well as in other interactions) or by relevant simulations.
- Asking questions and initiating short discussions to test understanding.
- Evaluating records and reports.

While this is primarily a workplace-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the exit level outcomes.

The assessment process should cover both the explicit tasks required for the qualification as well as the understanding of the concepts and principles that underpin the activities required of fluid power. The assessment process should also establish how the critical outcomes have been advanced by the learning process.

INTERNATIONAL COMPARABILITY

Fluid Power companies in South Africa are mostly representative of, or affiliated to, international counterparts. Work standards are benchmarked against international best practices, and these practices were used as the basis for compiling unit standards. Major global industry players

have contributed to the process of establishing appropriate standards and international comparability. This qualification was compared to similar outcomes-based qualifications in various countries as follows:

Australia:

Australia was chosen because its fluid power industry is service-based, similar to South Africa with mining, construction, fishing, agriculture, pulp and paper, automotive and off-shore industry activities that make use of fluid power systems.

The Australian National Training Authority have developed standards in fluid power that are incorporated into qualifications such as "printing and graphic arts", "automotive industry manufacturing" and "pulp and paper manufacturing", whereas the proposed qualification is directed towards a trade in fluid power. The proposed National Certificates are similar to the Australian Standards in that they:

• Set forth standards for competency based instruction and assessment directly related to the workplace.
• Outline assessment standards along with assessor qualifications.
• Require a balanced approach to the qualifications which include application and conceptual understanding of basic principles.
• Include the availability/process for RPL.
• Include unit standards.

The proposed National Certificates differ from the Australian standards in that they:

• Are specific to fluid power as an individual qualification. The Australian system uses individual Units of Competence regarding pneumatics and hydraulics which form part of engineering certificates.
• The South African unit standards are more detailed and specific, with progression to different levels.

United States of America:

America was chosen because they are the world's largest producer of fluid power components, with 2 of the largest manufacturing companies in the world (Parker and Eaton) having their corporate headquarters situated in Cleveland, Ohio. These companies have global manufacturing facilities and are represented in South Africa.

There are no mandated national standards for training fluid power technicians in the USA, however, ANSIIFPS/CS 1 specifies the testing procedures for the following career paths:

• Fluid power mechanic (as defined by the U.S. Department of Labour DOT 600.281-010).
• Fluid power technician (as defined by the U.S. Department of Labour DOT 007.161-026).
• Fluid power specialist (as defined by the U.S. Department of Labour DOT 007.061-014).
• Fluid power engineer.

Testing is conducted under the auspices of the Fluid Power Certification Board which shall be representative of manufacturers, distributors, users, educators and general interest groups, with no single category being in the majority. Written and practical tests are prepared by qualified fluid power professionals who are approved by the Fluid Power Certification Board.

The proposed National Certificates are similar to the USA standards in that they:

• Do not specify training requirements, but identify assessment criteria for competent performance at different levels in fluid power.

• Are specific to fluid power as an individual qualification.

The proposed National Certificates differ from the USA standards in that they:

• Do not have registered unit standards. but give broad requirements of competence, which are set by industry.
• There are no clear guidelines for progression from one qualification to another.
• The employers are responsible for determining levels of competence, except for the Fluid Power Engineer. who will be certified by the universities and state licensing boards.
• Certification is only valid for a period of 5 years, as specified by the Fluid Power Certification Board.

Japan:

Japan was selected because they are home to the largest pneumatic manufacturing company in the world (SMC). They also have a large original equipment manufacturer's market using pneumatic components for global distribution.

Japan has a National Trade Skill Test system which is certified by the government to test the technical skills and knowledge of working people according to uniform standards. This started in 1959 with five specific trades, and was expanded to 137 trades in 2004, inclUding "Pneumatic circuits and apparatus devices assembling" and "Hydraulic systems". The National Trade Skill Test takes place annually and the applicants must take practical and theoretical tests. Upon passing the examination, the Minister of Health. Labour and Welfare or Prefectural Governor issues the successful applicants a diploma and a "Certified Skilled Worker" award.

The results of the National Trade Skill Tests may be graded as follows:

• Advanced grade Skills required for managers and supervisors.
• 1st grade or non-classified grade Skills required for advanced skilled workers.
• 2nd grade Skills required for intermediate skilled workers.
• 3rd grade Skills required for novice workers.

The course content was not available in English and therefore could not be evaluated in detail for comparison.

Germany:

Germany was selected because they are a major producer of fluid power components and systems and is home to, amongst others, the following companies that are represented in South Africa: Festo. Bosch Rexroth, Norgren-Herion, Parker Ermeto. Walterscheidt, Voss and Burkert. Major innovations in hydraUlics stem from Germany and are practically applied in South Africa.

It was identified that Germany does not offer qualifications specific to fluid power, but that they do offer generic mechanical qualifications with courses in hydraulics or pneumatics in agricultural. industrial and automotive fields. These are generally conducted through industry based apprenticeship training with a duration of 42 months, which may be shortened to as little as 2 years, depending on prior learning. Assessments for these trades are undertaken by the Regional "Industrie und Handelskammer".

Specialised courses are offered by employers to train candidates to industry requirements. Much of this training material has been adopted by South African companies in their training courses. Elements of the MERSETA accredited course in mechatronics is presented by Festo, and most of the training material for that qualification is from Germany.

Africa:

It was identified that Botswana, Zimbabwe, Zambia, Namibia, Swaziland, Mauritius and Malawi do not have specific qualifications in fluid power, but most generic engineering qualifications contain courses in pneumatics and hydraulics. International companies and local mining houses represented in those countries provide short courses to equip candidates with specific skills required for areas of involvement. Generally a tradesman (fitter & turner, maintenance technicians, etc.) is employed to conduct machine maintenance, which includes various elements of fluid power.

Training equipment and materials have been supplied to the African countries mentioned above by Festo and Parker in South Africa to assist in their training processes. Of these countries, Botswana appears to be the most advanced in this field with government funded vocational colleges, incorporating fluid power training in Gabarone, Jwaneng, Selebi Pikwe, Palapye, Francistown and Maun. Namibia has training centres in Windhoek and in Walvisbay. Mauritius has one training centre in Port Louis. Swaziland has one training centre on the outskirts of Mbabane. Training conducted in these countries is against the same intemational work standards used in South Africa in the past, and it is anticipated that this qualificatlon will be useful in progressing the training conducted in these countries. Zambia, Zimbabwe, Malawi and Mozambique have little or no recorded public activity in this field due to current economic rebuilding.

ARTICULAnON OPTIONS

This qualification has been designed and structured as part of a progressive route in the rnanufacturinq and assembly processes industry so that qualifying learners can move from one level to the next. Employers or institutions should be able to evaluate the outcomes of this qualification against the needs of their context and structure top-up learning appropriately. Equally, holders of other qualifications may be evaluated against this qualification for the purpose of RPL. The use of generic unit standards in this qualification opens new avenues for the learner to progress from one qualification to another in related fields of study beyond fluid power.

This qualification leads on from the National Certificate in Fluid Power: NQF Level 3 and leads to the National Certificate in Fluid Power: NQF Level 5, where a more detailed approach to designing hydraulic systems is learnt. The use of generic unit standards in the qualification also ensures that a learner will not be trapped into a specific context, but may use the unit standards achieved as stepping stones to additional qualifications in engineering. Learners may also decide to further their career in one of the following fields:

- Electrical engineering.
- Mechanical engineering.
- Electrical and mechanical design.

Learners who have achieved this qualification have achieved generic skills that would enable them to follow a career in electrical or mechanical engineering. This qualification articulates horizontally with the following qualifications:

- ID 48474: Further Education and Training Certificate: Electrical Engineering at NQF Level 4.
- ID 58721: Further Education and Training Certificate: Engineering Fabrication at NQF Level 4.
- ID 23275: Further Education and Training Certificate: Mechanical Engineering: Fitting at NQF Level 4.

MODERATION OPTIONS

Moderators for the qualification should be qualified and accredited with an appropriate ETQA and have a suitable qualification in engineering with a minimum of 5 years experience in fluid power.

To assure the quality of the assessment process, the moderation should cover at least one of the following:

- Assessor credentials.
- The assessment instrument.
- The assessment process.

Where assessment and moderation are taking place in sectors other than the relevant SETA, assessment and moderation should be in terms of a memorandum of understanding negotiated with the relevant ETQA.

***CRITERIA FOR THE REGISTRATION* OF ASSESSORS**

- Appropriate qualification in the field of engineering, with a minimum of 5 years experience in the field of fluid power. The subject matter experience of the assessor can be established by recognition of prior learning.

- Appropriate experience and understanding of assessment theory, processes and practices.

- Good interpersonal skills and ability to balance the conflicting requirements of:
o Maintaining national standards.
o The interests of the learner.
o The need for transformation and redressing the legacies of the past.
o The cultural background and language of the learner.

- Registration as an assessor with the relevant ETQA.

- Any other criteria required by the relevant ETQA.

NOTES

N/A

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	13134	Install and orooram basic orocrammable looic controllers	Level 3	20
Core	244701	Conduct Advanced and Electro-Pneumatic Desion	Level 4	8
Core	244699	Conduct Basic Pneumatic Desion	Level 4	8
Core	244696	Desian oneumatic suoolv and conditionina svstems	Level 4	9
Core	244694	Install and test advanced hvdraulic svstems	Level 4	8
Core	13334	Install test and confiaure variable soeed control drives	Level 4	10
Core	13116	Install test and maintain an electro-oneumatic system	Level 4	20
Core	244692	Lavout and assemble a simole hvdraulic oower oack	Level 4	8
Core	244685	Maintain and troubleshoot hvdraulic svsterns	Level 4	12
Core	244707	Maintain fluid oower comoonents	Level 4	6
Core	244697	Reoalr variable displacement hvdraulic oumos and motors	Leyel4	12
Core	244703	Soecifv hvdraulic filtration and fluid reauirements	Leyel4	3
Core	244702	Test Hydraulic Cvlinders	Level 4	4
Core	120379	Work as a project team member	Level 4	8
Elective	120385	Apply a range of project management tools and techniques	Level 4	7
Elective	120374	Contribute to the management of project risk within own field of expertise	Level 4	5
Elective	13135	Install. test and confiaure bus svstems	Level 4	10
Elective	13235	Maintain the aualilY assurance system	Level 4	5
Elective	120387	Monitor, evaluate and communicate simple project schedules	Level 4	4
Elective	120375	Participate in the estimation and preparation of cost budget for a project or sub project and monitor and control actual cost aaainst budaet	Level 4	6
Elective	120382	Plan, organise and support project meetings and workshops	Level 4	4

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	243088	Weld carbon steel pipe, with combination welding processes using the gas tungsten arc welding and gas metal arc welding, in all positions	Level 4	8
Fundamental	119472	Accommodate audience and context needs in oral/signed **communication**	Level 3	5
Fundamental	119457	Interoret and use information from texts	Level 3	5
Fundamental	119467	Use language and communication in occupational learning programmes	Level 3	5
Fundamental	119465	Write/presenUsign texts for a range of communicative contexts	Level 3	5
Fundamental	12155	Apply comprehension skills to engage written texts in a business environment	Level 4	5
Fundamental	9015	Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related problems	Leve/4	6
Fundamental	119462	Engage in sustained oral/signed communication and evaluate spoken/sianed texts	Level 4	5
Fundamental	9016	Represent analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts	Level 4	4
Fundamental	119471	Use language and communication in occupational learning programmes	Level 4	5
Fundamental	7468	Use mathematics to investigate and monitor the financial aspects of personal, business, national and international issues	Level 4	6
Fundamental	12153	Use the writing process to compose texts required in the business environment	Level 4	5

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Maintain and troubleshoot hydraulic systems

SAQA USID	***UNIT STANDARD TITLE***		
244685	Maintain and troubleshoot hydraulic systems		
ORIGINATOR		***PROVIDER***	
8GB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technolocv		Manufacturing and Assembly	
ABETBAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 4	112

SPECIFIC OUTCOME 1
Prepare to find faults on a hydraulic system.

SPECIFIC OUTCOME 2
Find faults on the hydraulic system.

SPECIFIC OUTCOME 3
Prepare to maintain a hydraulic system.

SPECIFIC OUTCOME 4
Maintain the hydraulic system.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Layout and assemble a simple hydraulic power pack

SAQA USID	***/ UNIT STANDARD TITLE***		
244692	I Layout and assemble a simcle hydraulic power pack		
ORIGINATOR		***PROVIDER***	
SGB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturina. Enqineertnc and Technoloav		Manufacturina and Assemblv	
ABET BAND	I ***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	I Regular	Level 4	/8

SPECIFIC OUTCOME 1
Interpret hydraulic system design.

SPECIFIC OUTCOME 2
Demonstrate understanding of the interaction between hydraulic components.

SPECIFIC OUTCOME 3
Position hydraulic system components.

SPECIFIC OUTCOME 4
Assemble hydraulic power pack.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Install and test advanced hydraulic systems

SAQA *USID*	***UNIT STANDARD TITLE***		
244694	Install and test advanced hydraulic systems		
ORIGINATOR		***PROVIDER***	
8GB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		ManufacturinQ and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 4	18

SPECIFIC OUTCOME 1
Prepare to install a hydraulic system.

SPECIFIC OUTCOME 2
Install the hydraulic system.

SPECIFIC OUTCOME 3
Test the hydraulic system.

SPECIFIC OUTCOME 4
Maintain the hydraulic system.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

DesIgn pneumatic supply and conditioning systems

SAQA USID	*UNIT STANDARD TITLE*		
244696	Desion pneumatic supply and conditionino systems		
ORIGINATOR		*PROVIDER*	
5GB Manufacturino and Assemblv Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturina and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Reoular	Level 4	19

SPECIFIC OUTCOME 1
Demonstrate knowledge of airflow and air condition.

SPECIFIC OUTCOME 2
Identify air line system requirements.

SPECIFIC OUTCOME 3
Specify the piping and air service units.

SPECIFIC OUTCOME 4
Design the basic layout of the system.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Repair variable displacement hydraulic pumps and motors

SAQA USID	***UNIT STANDARD TITLE***		
244697	Repair variable displacement h'ldraulic pumps and motors		
ORIGINATOR		***PROVIDER***	
SGB Manufacturino and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerina and Technoloav		Manufacturina and Assemblv	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 4	12

SPECIFIC OUTCOME 1
Demonstrate understanding of variable displacement pumps and motors.

SPECIFIC OUTCOME 2
Prepare to strip the variable hydraulic pump or motor.

SPECIFIC OUTCOME 3
Strip the hydraulic pump or motor.

SPECIFIC OUTCOME 4
Inspect the hydraulic pump or motor components.

SPECIFIC OUTCOME 5
Prepare the components for assembly.

SPECIFIC OUTCOME 6
Assemble the hydraulic pump or motor.

SPECIFIC OUTCOME 7
Test the pump or motor.

SAQA

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Conduct Basic Pneumatic Design

SAQA USID	***UNIT STANDARD TITLE***		
244699	Conduct Basic Pneumatic Desk n		
ORIGINATOR		***PROVIDER***	
8GB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - ManufacturinQ, Engineering and Technotoav		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Reoular	Level 4	18

SPECIFIC OUTCOME 1
Develop motion step diagrams.

SPECIFIC OUTCOME 2
Select pneumatic actuators.

SPECIFIC OUTCOME 3
Select pneumatic valves and sensors.

SPECIFIC OUTCOME 4
Select air service components.

SPECIFIC OUTCOME 5
Develop pneumatic circuit diagrams.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Conduct Advanced and Electro-Pneumatic Design

SAQA USID	***UNIT STANDARD TITLE***		
244701	Conduct Advanced and Electro-Pneumatic Design		
ORIGINATOR		***PROVIDER***	
SGB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 4	18

SPECIFIC OUTCOME 1
Develop motion step diagrams and sequential function charts.

SPECIFIC OUTCOME 2
Select advanced pneumatic actuators.

SPECIFIC OUTCOME 3
Select pneumatic and electric valves and sensors.

SPECIFIC OUTCOME 4
Select air service and electric supply components.

SPECIFIC OUTCOME 5
Develop pneumatic and electric circuit diagrams.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Test Hydraulic Cylinders

SAQA USID	*UNIT STANDARD TITLE*		
244702	Test Hvdraulic Cvlinders		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
FJELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Tecbnoloav		Engineering and Related Design	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Regular	Level 4	14

SPECIFIC OUTCOME 1
Prepare a hydraulic cylinder for testing.

SPECIFIC OUTCOME 2
Set up instrumentation for testing of hydraulic cylinders.

SPECIFIC OUTCOME 3
Perform a proof pressure test on a hydraulic cylinder.

SPECIFIC OUTCOME 4
Perform a leakage test on a hydraUlic cylinder.

SPECIFIC OUTCOME 5
Perform a static friction test on a hydraulic cylinder.

SPECIFIC OUTCOME 6
Remove the cylinder from test stand.

SPECIFIC OUTCOME 7
Conduct post test functions.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Specify hydraulic filtration and fluid requirements

SAQA USID	***UNIT STANDARD TITLE***		
244703	Specify hydraulic filtration and fluid requirements		
ORIGINATOR		***PROVIDER***	
SGB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 4	13

SPECIFIC OUTCOME 1
Demonstrate understanding of oil cleanliness levels in a hydraulic system.

SPECIFIC OUTCOME 2
Explain the use of the different types of filters and clogging indicators.

SPECIFIC OUTCOME 3
Specify filters to be used in a hydraulic system.

SPECIFIC OUTCOME 4
Design Maintenance Specifications for Hydraulic filters.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Maintain fluid power components

SAQA *USID*		***UNIT STANDARD TITLE***	
244707		Maintain fluid power components	
ORIGINATOR		***PROVIDER***	
SGB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABETBAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 4	16

SPECIFIC OUTCOME 1
Prepare to strip the various types of hydraulic components.

SPECIFIC OUTCOME 2
Strip the hydraulic component.

SPECIFIC OUTCOME 3
Inspect the hydraulic components.

SPECIFIC OUTCOME 4
Prepare the components for assembly.

SPECIFIC OUTCOME 5
Assemble the hydraulic component.

SPECIFIC OUTCOME 6
Test the hydraulic components.

No. 727 17 August *2007*

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (5GB) for

Manufacturing and Assembly Processes

registered by Organising Field 06 - Manufacturing, Engineering and Technology, publishes the following Qualification and Uhit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saga.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and *no later than* 17 *September 2007.* All correspondence should be marked Standards Setting - Manufacturing and Assembly Processes and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 - 431-5144
e-mail: dmphuthing@saqa.org.za

DRS BHIKHA
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Certificate" Fluid Power

SAQA QUALID	*QUAL/FICAnON TITLE*		
58882	National Certificate: Fluid Power		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
National Certificate	6 - Manufacturing, Engineering and Technoloav	Manufacturing and Assembly	
ABET BAND	*MINIMUM CREDITS*	*NQFLEVEL*	*QUAL CLASS*
Undefined	135	Level 3	Regular-Unit Stds Based

PURPOSE OF THE QUALIFICAnON
Purpose:

The purpose of this qualification is to provide learners with the standards and range of learning required to work effectively in the fluid power environment, making use of the relevant skills and knowledge to make up fluid power systems.

This is the second qualification in a series for learners who would like to follow a career in fluid power and focuses on specialising skills in installing, maintaining and commissioning fluid power systems. This qualification builds on the learning undertaken in the National Certificate in fluid power at NQF Level 2, and it is assumed that learners entering into a learning programme towards this qualification are already competent in the core skills outlined in the NQF Level 2 qualification.

With this additional learning, learners will be able to make up fluid power systems under limited supervision. What learners achieve in this qualification will also serve as a basis for further learning where they will engage in more complex activities in testing and repairing fluid power circuits at NQF Level 4.

On completion of this qualification, the learner will be given recognition for the following exit level outcomes:

- Describe the operating principles of fluid power components.
- Make up fluid power pipes and tubes.
- Install, test and maintain fluid power systems.

Qualifying learners will be able to relate what they are doing to scientific and technological principles and concepts. They will also be able to maintain and support the various policies and procedures related to the safety, health, environment and quality systems that govern their workplace.

Learners will generally carry out their role within the context of:

- A fully equipped fluid power workshop.
- Given maintenance and works procedures.
- Given inspection and testing procedures.
- Given Quality Assurance policies, procedures and processes.

Rationale:

Industry is characterised by technologically sophisticated automation processes using systems that integrate the fields of mechanical and electrical engineering with fluid power. The field of fluid power deals with the assembly, installation, commissioning and maintenance of such systems that conform to all safety aspects as per regulations and legislation. People working in the fluid power field require specialised technical skills and knowledge as well as highly developed hand skills to enable' them to achieve these requirements.

This qualification in fluid power at NQF Level 3 is the second qualification in a series for learners who want to follow a career in the field of fluid power. This qualification focuses on developing skills and knowledge necessary to advance such a career and provides specific learning towards making up fluid power circuits.

There is a need for this qualification in the industry because many people who are able to apply fluid power principles in a given context would like to advance their skills onto more complex activities and start making up complete fluid power circuits. They will also benefit from applying fundamental life skills to their job in interpreting requirements and being held responsible for the results of what they do.

People who have achieved the skills and knowledge outlined in this qualification are normally employed in the following positions:

- FP System installer.
- Quality controller.
- Fluid power fitter.
- Hose and tube assembler.
- FP system assembler.
- FP component repairer.
- FP cylinder repairer.

Learners may advance from these positions to achieve the qualification in fluid power at NQF Level 4 where they will be required to test and repair either hydraulic or pneumatic circuits as necessary.

There are currently approximately 500 people employed in the industry that are required to make up fluid power circuits as would be learnt through this qualification. This implies that many learners will be able to be given Recognition of Prior Learning (RPL) for one or more unit standards making up this qualification, and that the qualification is required by industry.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
It is assumed that learners entering a programme towards this qualification have achieved a fluid power NQF Level 2 qualification or have the relevant experience.

Recognition of Prior Leaming:

This qualification may be obtained through the process of RPL. The learner should be thoroughly briefed prior to the assessment and support provided to assist in the process of developing a portfolio. While this is primarily a work-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the exit level outcomes.

Access to the Qualification:

This qualification recognises the skills, knowledge and values relevant in the workplace and will cater for learners who:

• Have attended courses and need to apply the knowledge gained to activities in the workplace.
• Are already workers and have acquired skills and knowledge without having attended formal training.
• Are part of a learnership program which integrates structured learning and operational experience?

Candidates applying for this qualification need to demonstrate physical competence in operating equipment and should therefore be physically able to contend with the circumstances required in the workshop environment.

Access for learners with physical disabilities is dependant on the following:

• Type and severity of disability.
• The nature of the process and requirements of equipment operation.

QUALIFICATION RULES
This qualification consists of a minimum of 135 credits made up as follows:

• Candidates are required to achieve all 20 credits for communication from the available Fundamental unit standards.

• Candidates are required to achieve all 16 credits for mathematical literacy within the context of electro-mechanical winding operations.

• Candidates must achieve all 74 credits from the Core unit standards.

• Candidates may select additional unit standards from any of the Elective unit standards to achieve a minimum of 25 credits.
o Note: The elective credits should be chosen in accordance with the requirements of the selected context and the interests of the learner.

EXIT LEVEL OUTCOMES
The exit level outcomes for this qualification reflect a combination of specific outcomes and critical cross-field education and training outcomes. The way in which the critical cross-field outcomes have been advanced through the learning required forthis qualification is embedded in the way in which the unit standards have been constructed. Critical cross-field outcomes form the basis of acquiring the skills, knowledge and values acquired through achievement of this qualification. The application of these cross-field outcomes in a specific context results in the achievement of specific outcomes. The integration of specific outcomes from a variety of unit standards results in the ability to achieve the exit level outcomes.

1. Describe the operating principles of fluid power components.

2. Make up fluid power pipes and tubes.

3. Install, test and maintain fluid power systems.

ASSOCIATED ASSESSMENT CRITERIA
Associated Assessment Criteria for Exit Level Outcome 1:

1.1 Fluid power components are identified in terms of their purpose.

1.2 Applications for each component are listed that are in accordance with manufacturer specifications.
1.3 Induced forces within fluid power components is described in terms of pressure and speed.

Associated Assessment Criteria for Exit Level Outcome 2:

2.1 Installation requirements are identified from given situations.
2.2 Hose and connectors are identified and selected in accordance with specific requirements.
2.3 Pipes and tubes are made up to given specifications, ensuring that all seals are used as per manufacturer specifications.
2.4 Pipes and tubes are bent as required without restricting flow.
2.5 Pipes and tubes are routed to provide optimal flow.
2.6 Fluid power conveyance systems are cleaned in accordance with recognised procedures.

Associated Assessment Criteria for Exit Level Outcome 3:

3.1 Fluid power system requirements are identified from given specifications and drawings.
3.2 Installation is completed in accordance with given instructions.
3.3 Fluid power systems are tested for compliance to requirements in accordance with workplace procedures.
3.4 Faults found are rectified in accordance with workplace procedures.
3.5 Work is conducted with due regard to the safety of personnel.
3.6 Instrumentation selected for specific tasks is appropriate to the type of test conducted.
3.7 Instrumentation is used in accordance with its design.
3.8 Measurements are within the allowable tolerances.
3.9 Post installation checks are conducted in accordance with workplace and industry standards.

Integrated Assessment:

The integrated assessment must be based on a summative assessment guide. The guide must indicate how the assessor will assess different aspects of the performance and will include:

- Observing the learner at work (in primary activities as well as in other interactions) or by relevant simulations.
- Asking questions and initiating short discussions to test understanding.
- Evaluating records and reports.

While this is primarily a workplace-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the exit level outcomes.

The assessment process should cover both the explicit tasks required for the qualification as well as the understanding of the concepts and principles that underpin the activities required of fluid power. The assessment process should also establish how the critical outcomes have been advanced by the learning process.

INTERNATIONAL COMPARABILITY

Fluid Power companies in South Africa are mostly representative of, or affiliated to, international counterparts. Work standards are benchmarked against international best practices, and these practices were used as the basis for compiling unit standards. Major global industry players have contributed to the process of establishing appropriate standards and international comparability. This qualification was compared to similar outcomes-based qualifications in various countries as follows:

Australia:

Australia was chosen because its fluid power industry is service-based, similar to South Africa with mining, construction, fishing, agriculture, pulp and paper, automotive and off-shore industry activities that make use of fluid power systems.

The Australian National Training Authority have developed standards in fluid power that are incorporated into qualifications such as "printing and graphic arts", "automotive industry manufacturing" and "pulp and paper manufacturing", whereas the proposed qualification is directed towards a trade in fluid power.

The proposed National Certificates are similar to the Australian Standards in that they:

• Set forth standards for competency based instruction and assessment directly related to the workplace.
• Outline assessment standards along with assessor qualifications.
• Require a balanced approach to the qualifications which include application and conceptual understanding of basic principles.
• Include the availability/process for RPI.
• Include unit standards.

The proposed National Certificates differ from the Australian standards in that they:

• Are specific to fluid power as an individual qualification. The Australian system uses individual UnitS of Competence regarding pneumatics and hydraulics which form part of engineering certificates.
• The South African unit standards are more detailed and specific, with progression to different levels.

United States of America:

America was chosen because they are the world's largest producer of fluid power components, with 2 of the largest manufacturing companies in the world (Parker and Eaton) having their corporate headquarters situated in Cleveland, Ohio. These companies have global manufacturing facilities and are represented in South Africa.

There are no mandated national standards for training fluid power technicians in the USA, however, ANSIIFPS/CS 1 specifies the testing procedures for the following career paths:

• Fluid power mechanic (as defined by the U.S. Department of Labour DOT 600.281-010).
• Fluid power technician (as defined by the U.S. Department of Labour DOT 007.161-026).
• Fluid power specialist (as defined by the U.S. Department of Labour DOT 007.061-014).
• Fluid power engineer.

Testing is conducted under the auspices of the Fluid Power Certification Board which shall be representative of manufacturers, distributors, users, educators and general interest groups, with no single category being in the majority. Written and practical tests are prepared by qualified fluid power professionals who are approved by the Fluid Power Certification Board.

The proposed National Certificates are similar to the USA standards in that they:

• Do not specify training requirements, but identify assessment criteria for competent performance at different levels in fluid power.
• Are specific to fluid power as an individual qualification.

The proposed National Certificates differ from the USA standards in that they:

• Do not have registered unit standards, but give broad requirements of competence, which are set by industry.
• .There are no clear guidelines for progression from one qualification to another.
• Theemployers are responsible for determining levels of competence, except for the Fluid Power Engineer, who will be certified by the universities and state licensing boards.
• Certification is only valid for a period of 5 years, as specified by the Fluid Power Certification Board.

Japan:

Japan was selected because they are home to the largest pneumatic manufacturing company in the world (SMC). They also have a large original equipment manufacturer's market using pneumatic components for global distribution.

Japan has a National Trade Skill Test system which is certified by the government to test the technical skills and knowledge of working people according to uniform standards. This started in 1959 with five specific trades, and was expanded to 137 trades in 2004, including "Pneumatic circuits and apparatus devices assembling" and "Hydraulic systems". The National Trade Skill Test takes place annually and the applicants must take practical and theoretical tests. Upon passing the examination, the Minister of Health, Labour and Welfare or Prefectural Governor issues the successful applicants a diploma and a "Certified Skilled Worker" award.

The results of the National Trade Skill Tests may be graded as follows:

• Advanced grade Skills required for managers and supervisors.
• 1st grade or non-classified grade Skills required for advanced skilled workers.
• 2nd grade Skills required for intermediate skilled workers.
• 3rd grade Skills required for novice workers.

The course content was not available in English and therefore could not be evaluated in detail for comparison.

Germany:

Germany was selected because they are a major producer of fluid power components and systems and is home to, amongst others, the following companies that are represented in South Africa: Festo, Bosch Rexroth, Norgren-Herion, Parker Ermeto, Walterscheidt, Voss and BOrkert. Major innovations in hydraulics stem from Germany and are practically applied in South Africa.

It was identified that Germany does not offer qualifications specific to fluid power, but that they do offer generic mechanical qualifications with courses in hydraulics or pneumatics in agricultural, industrial and automotive fields. These are generally conducted through industry based apprenticeship training with a duration of 42 months, which may be shortened to as little as 2 years, depending on prior learning. Assessments for these trades are undertaken by the Regional "Industrie und Handelskammer".

Specialised courses are offered by employers to train candidates to industry requirements. Much of this training material has been adopted by South African companies in their training courses. Elements of the MERSETA accredited course in mechatronics is presented by Festo, and most of the training material for that qualification is from Germany.

Africa:

It was identified that Botswana, Zimbabwe, Zambia, Namibia, Swaziland, Mauritius and Malawi do not have specific qualifications in fluid power, but most generic engineering qualifications contain courses in pneumatics and hydraulics. International companies and local mining houses

represented in those countries provide short courses to equip candidates with specific skills required for areas of involvement. Generally a tradesman (fitter & turner, maintenance technicians, etc.) is employed to conduct machine maintenance, which includes various elements of fluid power.

Training equipment and materials have been supplied to the African countries mentioned above by Festo and Parker in South Africa to assist in their training processes. Of these countries, Botswana appears to be the most advanced in this field with government funded vocational colleges, incorporating fluid power training in Gabarone, Jwaneng, Selebi Pikwe, Palapye, Francistown and Maun. Namibia has training centres in Windhoek and in Walvisbay. Mauritius has one training centre in Port Louis. Swaziland has one training centre on the outskirts of Mbabane. Training conducted in these countries is against the same international work standards used in South Africa in the past, and it is anticipated that this qualification will be useful in progressing the training conducted in these countries. Zambia, Zimbabwe, Malawi and Mozambique have little or no recorded public activity in this field due to current economic rebuilding.

ARTICULATION OPTIONS

This qualification leads on from the National Certificate in Fluid Power: Level 2 and leads to the Further Education and Training Certificate in Fluid Power: NQF Level 4. The use of generic unit standards in the qualification also ensures that a learner will not be trapped into a specific context, but may use the unit standards achieved as stepping stones to additional qualifications in engineering.

Learners may also decide to further their career in one of the following fields:

- Electrical Engineering (under development).
- Mechanical Engineering (under development).

Learners who have achieved this qualification have achieved generic skills that would enable them to follow a career in electrical or mechanical engineering. This qualification articulates horizontally with the following qualifications:

- 1048475: National Certificate: Electrical Engineering, NQF Level 3.
- 1058720: National Certificate: Engineering Fabrication, NQF Level 3.
- 1023274: National Certificate: Mechanical Engineering: Fitting, NQF Level 3.
- 1050062: National Certificate: Occupational Hygiene and Safety, NQF Level 3.

MODERATION OPTIONS

Moderators for the qualification should be qualified and accredited with an appropriate ETQA and have a suitable qualification in engineering with a minimum of 5 years experience in fluid power.

To assure the quality of the assessment process, the moderation should cover at least one of the following:

- Assessor credentials.
- The assessment instrument.
- The assessment process.

Where assessment and moderation are taking place in sectors other than the relevant SETA, assessment and moderation should be in terms of a memorandum of understanding negotiated with the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

• Appropriate qualification in the field of engineering, with a minimum of 5 years experience in the field of fluid power. The subject matter experience of the assessor can be established by recognition of prior learning.

• Appropriate experience and understanding of assessment theory, processes and practices

• Good interpersonal skills and ability to balance the conflicting requirements of:
o Maintaining national standards.
o The interests of the learner.
o The need for transformation and redressing the legacies of the past.
o The cultural background and language of the learner.

• Registration as an assessor with the relevant ETQA.

• Any other criteria required by the relevant ETQA.

NOTES
N/A

UNIT STANDARDS

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	12477	Identify engineering materials, their characteristics and applications and common metal tests used in enoineerina	Level 2	4
Core	244717	Clean fluid convevance svstems	Level 3	6
Core	244716	Demonstrate understanding of the operating principles of hvdraulic components	Level 3	6
Core	244714	Demonstrate understanding of the operating principles of pneumatic components	Level 3	6
Core	13117	Install test and maintain a basic hvdraulic svstem	level 3	10
Core	13139	Install, test and maintain a basic pneumatic system	level 3	10
Core	244712	Make UP fluid power tube assemblies	Level 3	5
Core	9885	Read and interpret engineering drawings	Level 3	12
Core	244710	Route and install hydraulic and pneumatic tubino	Level 3	4
Core	244704	Select and fit seals in fluid Dower applications	Level 3	6
Core	244683	Use and maintain fluid DOwer instrumentation	Level 3	5
Elective	13214	Operate and monitor a drilling machine to produce simple components	Level 2	6
Elective	13205	Operate and monitor a lathe to produce simple comoonents	level 2	12
Elective	13204	Operate and monitor a milling machine to produce simple components	Level 2	12
Elective	13215	Operate and monitor a surface grinding machine to produce simole comoonents	Level 2	8
Elective	13234	Applv Quality procedures	level 3	8
Elective	113899	Demonstrate an understanding of basic programmable logic controllers	Level 3	6
Elective	12429	Develop a personal financial Dian	Level 3	2
Elective	12456	Explain and use oraanisational orocedures	Level 3	6
Elective	244709	Make UP hydraulic hose assemblies	Level 3	6
Elective	9526	Manaae basic business finance	Level 3	6
Elective	244705	Remove and fit pneumatic components	Level 3	3
Elective	244715	Reoair a hydraulic cylinder	Level 3	6
Elective	244713	Reoair and test a pneumatic cvlinder	Level 3	6
Elective	244711	Repair fixed disolacement Dumos and motors	Level 3	8
Elective	116720	Show understandinc of diversitY in the workplace	Level 3	3
Elective	13274	Test the ehvsical orooerties of enaineerina metals	Leve13'	4
Elective	119078	Use a GUI-based word processor to enhance a document through the use of tables and columns	Level 3	5
Elective	116940	Use a Graphical User Interface (GUIl-based spreadsheet application to solve a aiven oroblem	Level 3	6
Elective	243052	Weld carbon steel work pieces using the cored-wire weldina process in all oositions	Level 3	8

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119472	Accommodate audience and context needs in oraVsigned communication	Level 3	5
Fundamental	9010	Demonstrate an understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	Level 3	2
Fundamental	9013	Describe, apply, analyse and calculate shape and motion in 2-and 3-dimensional soace in different contexts	Level 3	4
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	9012	Investigate life and work related problems using data and orobabilities	Level 3	5
Fundamental	119467	Use language and communication in occupational learninQ ercoramrnes	Level 3	5
Fundamental	7456	Use mathematics to investigate and monitor the financial aspects of personal. business and national issues	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Use and maintain fluid power instrumentation

SAQA USID	***UNIT STANDARD TITLE***		
244683	Use and maintain fluid power instrumentation		
ORIGINATOR		***PROVIDER***	
8GB Manufacturing and Assembly Processes		..	
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technoiogv		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 3	15

SPECIFIC OUTCOME 1
Demonstrate an understanding of fluid power instrumentation.

SPECIFIC OUTCOME 2
Use fluid power instrumentation.

SPECIFIC OUTCOME 3
Maintain fluid power instrumentation.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Select and fit seals in fluid power applications

SAQA USID	***UNIT STANDARD TITLE***		
244704	Select and fit seals in fluid power applications		
ORIGINATOR		***PROVIDER***	
SGB Manufacturing and Assemblv Processes			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerina and Technoloav		Manufacturina and Assemblv	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Reaular	Level 3	16

SPECIFIC OUTCOME 1
Demonstrate understanding of the different types of seals and seal materials.

SPECIFIC OUTCOME 2
Demonstrate understanding of the use of seals in fluid power.

SPECIFIC OUTCOME 3
Remove and fit seals to fluid power components.

SPECIFIC OUTCOME 4
Inspect and evaluate condition of seals.

SOUTH AFRICAN QUAI.IFICATIONS AUTHORITY

UNIT STANDARD:

Remove and fit pneumatic components

SAQA USID	***UNIT STANDARD TITLE***		
244705	Remove and fit pneumatic com oonents		
ORIGINATOR		***PROVIDER***	
5GB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, Enoineering and Technoloov		ManufacturinQ and Assemblv	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 3	13

SPECIFIC OUTCOME 1
Prepare to remove pneumatic components.

SPECIFIC OUTCOME 2
Remove pneumatic components.

SPECIFIC OUTCOME 3
Install pneumatic components.

SPECIFIC OUTCOME 4
Test functionality of the replaced component.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Make up hydraulic hose assemblies

SAQA USID	***UNIT STANDARD TITLE***		
244709	Make UP hvdraulic hose assemblies		
ORIGINATOR		***PROVIDER***	
5GB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 3	16

SPECIFIC OUTCOME 1
Identify hydraulic hose and component types and matching criteria.

SPECIFIC OUTCOME 2
Prepare to make up hose assembly.

SPECIFIC OUTCOME 3
Make up hose assembly.

SPECIFIC OUTCOME 4
Inspect and test hose assembly.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Route and install hydraulic and pneumatic tubing

SAQA USID	***UNIT STANDARD TITLE***		
244710	Route and install hydraulic and oneumatlc tubino		
ORIGINATOR		***PROVIDER***	
8GB Manufacturino and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturina, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Reoular	level 3	14

SPECIFIC OUTCOME 1
Demonstrate an understanding of the Installation requirements.

SPECIFIC OUTCOME 2
Route and install tubing.

SPECIFIC OUTCOME 3
Conduct post installation procedures.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Repair fixed displacement pumps and motors

SAQA USID	***UNIT STANDARD TITLE***		
244711	Repair fixed displacement pumps and motors		
ORIGINATOR		***PROVIDER***	
SGB Manufacturina and Assembly Processes			
FIELD		***SUBFIELD***	
6 - ManUfacturing, Engineerina and Technolocv		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 3	18

SPECIFIC OUTCOME 1
Demonstrate understanding of fixed displacement pumps and motors.

SPECIFIC OUTCOME 2
Prepare to strip the hydraulic pump or motor.

SPECIFIC OUTCOME 3
Strip the hydraulic pump or motor.

SPECIFIC OUTCOME 4
Inspect the hydraulic pump or motor components.

SPECIFIC OUTCOME 5
Prepare the components for assembly.

SPECIFIC OUTCOME 6
Assemble the hydraulic pump or motor.

SPECIFIC OUTCOME 7
Test the pump or motor.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Make up fluid power tube assemblies

$AQAUSID	***UNIT STANDARD TITLE***		
244712	Make up fluid power tube assemblies		
ORIGINATOR		***PROVIDER***	
5GB Manufacturina and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerina and Technologv		Manufacturina and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	1***CREDITS***
Undefined	, Regular	Level 3	15

SPECIFIC OUTCOME 1
Demonstrate an understanding of tubes and fittings.

SPECIFIC OUTCOME 2
Demonstrate an understanding of the different methods of attaching tubes and fittings.

SPECIFIC OUTCOME 3
Make up fluid power tube assembly.

SOUTH AFRICAN QUALIFICATIONS AU"rHORITY

UNIT STANDARD:

Repair and test a pneumatic cylinder

SAQA USID	***UNIT STANDARD TITLE***		
244713	Reoair and test a oneumatic cylinder		
ORIGINATOR		***PROVIDER***	
SGB Manufacturina and Assemblv Processes			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerina and Technoloav		Manufacturina and Assemblv	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 3	16

SPECIFIC OUTCOME 1
Prepare to strip the cylinder.

SPECIFIC OUTCOME 2
Strip a pneumatic cylinder.

SPECIFIC OUTCOME 3
Inspect the cylinder components.

SPECIFIC OUTCOME 4
Prepare the components for assembly.

SPECIFIC OUTCOME 5
Assemble the cylinder.

SPECIFIC OUTCOME 6
Test the cylinder.

SPECIFIC OUTCOME 7
Prepare pneumatic cylinders for dispatch.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of the operating principles of pneumatic components

SAQA USID	UNIT STANDARD TITLE		
244714	Demonstrate understanding of the operating principles of pneumatic components		
ORIGINATOR		***PROVIDER***	
SGB Manufacturina and Assemblv Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 3	16

SPECIFIC OUTCOME 1
Demonstrate understanding of advanced pneumatic components.

SPECIFIC OUTCOME 2
Demonstrate understanding of applications for pneumatic components.

SPECIFIC OUTCOME 3
Setup and calibrate various pneumatic components.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Repair a hydraulic cylinder

SAQA USID	***UNIT STANDARD TITLE***		
244715	Repair a hydraulic cylinder		
ORIGINATOR		***PROVIDER***	
SGB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Reaular	Level 3	16

SPECIFIC OUTCOME 1
Prepare to strip the cylinder.

SPECIFIC OUTCOME 2
Strip a hydraulic cylinder.

SPECIFIC OUTCOME 3
Inspect the cylinder components.

SPECIFIC OUTCOME 4
Prepare the components for assembly.

SPECIFIC OUTCOME 5
Assemble the cylinder.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of the operating principles of hydraulic components

SAQA USID	*UNIT STANDARD TITLE*		
244716	Demonstrate understanding of the operating principles of hydraulic components		
ORIGINATOR		*PROVIDER*	
SGB Manufacturina and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturina. Engineerina and Technoloov		Manufacturina and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	16

SPECIFIC OUTCOME 1
Demonstrate understanding of hydraulic components.

SPECIFIC OUTCOME 2
Demonstrate understanding of applications for hydraulic components.

SPECIFIC OUTCOME 3
Setup various hydraulic components.

SPECIFIC OUTCOME 4
Demonstrate understanding of induced forces within hydraulic components.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Clean fluid conveyance systems

SAQA USID	*UNIT STANDARD TITLE*		
244717	Clean fluid conveyance systems		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	16

SPECIFIC OUTCOME 1
Prepare to clean fluid conveyance system.

SPECIFIC OUTCOME 2
Obtain the specified medium and delivery equipment to clean fluid conveyance system.

SPECIFIC OUTCOME 3
Clean fluid conveyance system and measure cleanliness achieved.

SPECIFIC OUTCOME 4
Hand over fluid conveyance system.

N9.728 17 August 2007

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation *24(c)* of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Manufacturing and Assembly Processes

registered by Organising Field 06 - Manufacturing, Engineering and Technology, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at **www.saqa.org.za**. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and *no later than* 17 September *2007.* All correspondence should be marked Standards Setting - Manufacturing and Assembly Processes and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 -431-5144'
e-mail: dmphuthing@saqa.org.za

DRS BHIKHA
DIRECTOR: STANDARDS SETIING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Certificate" Fluid Power

SAQA QUALID	*QUALIFICATION TITLE*		
58881	I National Certificate: Fluid Power		
ORIGINATOR		*PROVIDER*	
5GB Manufacturing and Assemblv Processes			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD·*	
National Certificate	6 - Manufacturing, Engineering and Technoloav	Manufacturing and Assembly	
ABET BAND	*MINIMUM CREDITS*	*NQF LEVEL*	*QUAL CLASS*
Undefined	120	Level 2	Regular-Unit 5tds Based

PURPOSE OF THE QUALIFICATION
Purpose:

The purpose of this qualification is to provide learners with the standards and range of learning required to work effectively in the fluid power environment, making use of the relevant knowledge to identify different components of fluid power systems and to make up basic electrical and fluid power circuits.

This qualification is the starting point for a person wanting to follow a career in fluid power. The primary skill that is recognised in this qualification is the ability to apply the relevant skills and knowledge to make up basic electrical and mechanical fluid power circuits from engineering drawings and to use and care for the relevant equipment in a responsible manner.

This qualification incorporates an understanding of basic operational procedures and how to read and interpret workshop manuals, workshop procedures, task instructions and job cards, as well as knowledge of engineering tools and equipment.

On completion of this qualification, the learner will be given recognition for the following exit level outcomes:

- Communicate with peers and supervisors in a manufacturing work context.
- Explain the principles of hydraulic and pneumatic power.
- Make up basic fluid power circuits from given drawings and available parts.
- Use and maintain engineering tools.
- Work as part of a team to make up circuits.

These capabilities require an understanding of electrical theory and fluid power principles, concepts of measurement, engineering drawings and circuit diagrams. Hand skills and the use of tools play an important role in this qualification.

Qualifying learners will be able to relate what they are doing to scientific and technological principles and concepts. They will also be able to maintain and support the various policies and procedures related to the safety, health, environment and quality systems that govern their workplace.

What learners achieve in this qualification will serve as a basis for further learning where they will engage more directly in the installation, maintenance and commissioning of fluid power systems.

Learners will generally carry out their role within the context of:

- A fully equipped fluid power workshop.
- Given maintenance and works procedures.
- Given inspection and testing procedures.
- Given Quality Assurance policies, procedures and processes.

Rationale:

Industry is characterised by technologically sophisticated automation processes using systems that integrate the fields of mechanical and electrical engineering with fluid power. The field of fluid power deals with the assembly, installation, commissioning and maintenance of such systems that conform to all safety aspects as per regulations and legislation. People working in the fluid power field require specialised technical skills and knowledge as well as highly developed hand skills to enable them to achieve these requirements.

This is the first qualification in a series for learners who would like to follow a career in fluid power. This series reflects the skills, knowledge and understanding required to perform effectively in industry, whether in micro, small. medium or large enterprises. This qualification focuses on developing skills and knowledge necessary to begin such a career and provides specific learning in the theoretical knowledge of fluid power principles and how these can be applied to electrical and fluid power circuits.

There is a need for this qualification in the industry because many people enter into jobs where they are required to apply fluid power principles in a given context. They will also benefit from learning the fundamental aspects of working as a team and communicating information when making up basic fluid power circuits, as this forms an integral part of the job.

This qualification typically forms the starting point in a career in fluid power and people who achieve this qualification may be employed in the following key positions:

- Engineering assistant.
- Component assembler.
- Storeman.
- Sales trainee.

Learners may advance from these positions to achieve the qualification in fluid power at NQF level 3 where they will be required to install and maintain fluid power systems.

There are currently approximately 3000 people employed in the industry that are required to perform basic fluid power operations as would be learnt through this qualification. This implies that many learners will be able to be given Recognition of Prior Learning (RPL) for one or more unit standards making up this qualification, and that the qualification is required by industry.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
It is assumed that learners entering a programme towards this qualification have the ability to communicate at NQF Level 1 and have mathematical literacy skills at NQF Level 1. The learning is practical in nature and it is further assumed that learners will have access to a fluid power workshop, whether through the training provider or an employer.

Recognition of Previous Leaming:

This qualification may be obtained through the process of RPL. The learner should be thoroughly briefed prior to the assessment and support provided to assist in the process of developing a portfolio. While this is primarily a work-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the exit level outcomes.

Access to the Qualification:

This qualification recognises the skills, knowledge and values relevant in the workplace and will cater for learners who:

• Have attended courses and need to apply the knowledge gained to activities in the workplace.
• Are already workers and have acquired skills and knowledge without having attended formal training.
• Are part of a learnership program which integrates structured learning and operational experience.

Candidates applying for this qualification need to demonstrate physical competence in operating equipment and should therefore be physically able to contend with the circumstances required in the workshop environment. Access for learners with physical disabilities is dependant on the following:

• Type and severity of disability.
• The nature of the process and requirements of equipment operation.

QUAUFICATION RULES
This qualification consists of a minimum of 120 credits made up as follows:

• Candidates are required to achieve all 20 credits for communication from the available fundamental unit standards.
• Candidates are required to achieve all 16 credits for mathematical literacy within the context of electro-mechanical winding operations.
• Candidates must achieve all 72 credits from the core unit standards.
• Candidates may select additional unit standards from any of the elective unit standards to achieve a minimum of 12 credits.

Note: The elective credits should be chosen in accordance with the requirements of the selected context and the interests of the learner.

EXIT LEVEL OUTCOMES
The exit level outcomes for this qualification reflect a combination of specific outcomes and critical cross-field education and training outcomes. The way in which the critical cross-field outcomes have been advanced through the learning required for this qualification is embedded in the way in which the unit standards have been constructed. Critical cross-field outcomes form the basis of acquiring the skills, knowledge and values acquired through achievement of this qualification. The application of these cross-field outcomes in a specific context results in the achievement of specific outcomes. The integration of specific outcomes from a variety of unit standards results in the ability to achieve the exillevel outcomes.

1. Communicate with peers and supervisors in a manufacturing work context.

2. Explain the principles of hydraulic and pneumatic power.

3. Make up basic fluid power circuits from given drawings and available parts.

4. Use and maintain engineering tools and equipment.

5. Work as part of a team to make up circuits.

ASSOCIATED ASSESSMENT CRITERIA

Associated assessment criteria for Exit Level Outcome 1:

1.1 Oral communication is maintained and adapted as required to promote effective interaction in a work context.
1.2 Terminology used is appropriate to the situation and in accordance with normal workplace usage.
1.3 Information related to work tasks is accessed and interpreted from a range of written and oral sources to ensure that work requirements are understood.
1.4 Communication is clear and unambiguous and at an appropriate level for designated target audiences.
1.5 Information communicated is accurate and conveyed in accordance with acceptable timeframes.
1.6 Communication is effective, regular and ongoing.

Associated assessment criteria for Exit Level Outcome 2:

2.1 Fluids and fluid flow is explained in terms of scientific principles.
2.2 Pressure in flow of fluids is described in relation to speed and volume.
2.3 Methods of converting hydraulic and pneumatic power to mechanical power are described in accordance with accepted physics principles.

Associated assessment criteria for Exit Level Outcome 3:

3.1 Fluid power circuit diagrams and symbols are interpreted in terms of the components required and the functions to be performed.
3.2 The different types of fluid power components are identified and described in terms of their application in the circuit.
3.3 Adjustments that can be made are identified and described in terms of the effect on the total system.
3.4 Actuators and valves are described in terms of their functions and potential applications in a system.
3.5 Differences between fluid power connectors are identified and explained in terms of connection and sealing methods.

Associated assessment criteria for Exit Level Outcome 4:

4.1 Engineering tools and equipment are selected and used in accordance with their design and are appropriate for the task at hand.
4.2 Tools and equipment required for the scope of work are sourced from available supplies.
4.3 Tools and equipment are checked for condition prior to use. Faulty tools are identified and replaced or repaired as appropriate.
4.4 Tools and equipment are used according to manufacturer operating gUidelines.

Associated assessment criteria for Exit Level Outcome 5:

5.1 Work is conducted safely with due care for self, fellow workers, machines. equipment, materials and environment.
5.2 Work outputs facilitate effective achievement of group goals.
5.3 Personal relations are developed to maximise team output.

5.4 Responsibilities of different team members and the impact of poor workmanship in any area are explained in terms of the team output.

Integrated Assessment:

The integrated assessment must be based on a summative assessment guide. The guide must indicate how the assessor will assess different aspects of the performance and will include:

- Observing the learner at work (in primary activities as well as in other interactions) or by relevant simulations.
- Asking questions and initiating short discussions to test understanding.
- Evaluating records and reports.

While this is primarily a workplace-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the exit level outcomes.

The assessment process should cover both the explicit tasks required for the qualification as well as the understanding of the concepts and principles that underpin the activities required of fluid power. The assessment process should also establish how the critical outcomes have been advanced by the learning process.

INTERNATIONAL COMPARABILITY

Fluid Power companies in South Africa are mostly representative of, or affiliated to, international counterparts. Work standards are benchmarked against international best practices, and these practices were used as the basis for compiling unit standards. Major global industry players have contributed to the process of establishing appropriate standards and international comparability. This qualification was compared to similar outcomes-based qualifications in various countries as follows:

Australia:

Australia was chosen because its fluid power industry is service-based, similar to South Africa with mining, construction, fishing, agriculture, pulp and paper, automotive and off-shore industry activities that make use of fluid power systems.

The Australian National Training Authority have developed standards in fluid power that are incorporated into qualifications such as "printing and graphic arts", "automotive industry manufacturing" and "pulp and paper manufacturing", whereas the proposed qualification is directed towards a trade in fluid power. The proposed National Certificates are similar to the Australian Standards in that they:

- Set forth standards for competency based instruction and assessment directly related to the workplace.
- Outline assessment standards along with assessor qualifications.
- Require a balanced approach to the qualifications which include application and conceptual understanding of basic principles.
- Include the availability/process for RPL.
- Include unit standards.

The proposed National Certificates differ from the Australian standards in that they:

- Are specific to fluid power as an individual qualification. The Australian system uses individual Units of Competence regarding pneumatics and hydraulics which form part of engineering certificates.
- The South African unit standards are more detailed and specific, with progression to different levels.

United States of America:

America was chosen because they are the world's largest producer of fluid power components, with 2 of the largest manufacturing companies in the world (Parker and Eaton) having their corporate headquarters situated in Cleveland, Ohio. These companies have global manufacturing facilities and are represented in South Africa.

There are no mandated national standards for training fluid power technicians in the USA, however, ANSI/FPS/CS 1 specifies the testing procedures for the following career paths:

- Fluid power mechanic (as defined by the U.S. Department of Labour DOT 600.281-010).
- Fluid power technician (as defined by the U.S. Department of Labour DOT 007.161-026).
- Fluid power specialist (as defined by the U.S. Department of Labour DOT 007.061-014).
- Fluid power engineer.

Testing is conducted under the auspices of the Fluid Power Certification Board which shall be representative of manufacturers, distributors, users, educators and general interest groups, with no single category being in the majority. Written and practical tests are prepared by qualified fluid power professionals who are approved by the Fluid Power Certification Board.

The proposed National Certificates are similar to the USA standards in that they:

- Do not specify training requirements, but identify assessment criteria for competent performance at different levels in fluid power.
- Are specific to fluid power as an individual qualification.

The proposed National Certificates differ from the USA standards in that they:

- Do not have registered unit standards, but give broad requirements of competence, which are set by industry.
- There are no-clear guidelines for progression from one qualification to another.
- The employers are responsible for determining levels of competence, except for the Fluid Power Engineer, who will be certified by the universities and state licensing boards.
- Certification is only valid for a period of 5 years, as specified by the Fluid Power Certification Board.

Japan:

Japan was selected because they are home to the largest pneumatic manufacturing company in the world (SMC). They also have a large original equipment manufacturer's market using pneumatic components for global distribution.

Japan has a National Trade Skill Test system which is certified by the govemment to test the technical skills and knowledge of working people according to uniform standards. This started in 1959 with five specific trades, and was expanded to 137 trades in 2004, including "Pneumatic circuits and apparatus devices assembling" and "Hydraulic systems". The National Trade Skill Test takes place annually and the applicants must take practical and theoretical tests. Upon passing the examination, the Minister of Health, Labour and Welfare or Prefectural Governor issues the successful applicants a diploma and a-"Certified Skilled Worker" award.

The results ofthe National Trade Skill Tests may be graded as follows:

- Advanced grade Skills required for managers and supervisors.
- 1st grade or non-classified grade Skills required for advanced skilled workers.
- 2nd grade Skills required for intermediate skilled workers.

- 3rd grade Skills required for novice workers.

The course content was not available in English and therefore could not be evaluated in detail for comparison.

Germany:

Germany was selected because they are a major producer of fluid power components and systems and is home to, amongst others, the following companies that are represented in South Africa: Festo, Bosch Rexroth, Norgren-Herion, Parker Ermeto, Walterscheidt, Voss and BUrkert. Major innovations in hydraulics stem from Germany and are practically applied in South Africa.

It was identified that Germany does not offer qualifications specific to fluid power, but that they do offer generic mechanical qualifications with courses in hydraulics or pneumatics in agricultural, industrial and automotive fields. These are generally conducted through industry based apprenticeship training with a duration of 42 months, which may be shortened to as little as 2 years, depending on prior learning. Assessments for these trades are undertaken by the Regional "Industrie und Handelskammer".

Specialised courses are offered by employers to train candidates to industry requirements. Much of this training material has been adopted by South African companies in their training courses. Elements of the MERSETA accredited course in mechatronics is presented by Festo, and most of the training material for that qualification is from Germany.

Africa:

It was identified that Botswana, Zimbabwe, Zambia, Namibia, Swaziland, Mauritius and Malawi do not have specific qualifications in fluid power, but most generic engineering qualifications contain courses in pneumatics and hydraulics. International companies and local mining houses represented in those countries provide short courses to equip candidates with specific skills required for areas of involvement. Generally a tradesman (fitter & turner, maintenance technicians, etc.) is employed to conduct machine maintenance, which includes various elements of fluid power.

Training equipment and materials have been supplied to the African countries mentioned above by Festo and Parker in South Africa to assist in their training processes. Of these countries, Botswana appears to be the most advanced in this field with government funded vocational colleges, incorporating fluid power training in Gabarone, Jwaneng, Selebi Pikwe, Palapye, Francistown and Maun. Namibia has training centres in Windhoek and in Walvisbay. Mauritius has one training centre in Port Louis. Swaziland has one training centre on the outskirts of Mbabane. Training conducted in these countries is against the same international work standards used in South Africa in the past, and it is anticipated that this qualification will be useful in progressing the training conducted in these countries. Zambia, Zimbabwe, Malawi and Mozambique have little or no recorded public activity in this field due to current economic rebuilding.

ARTICULATION OPTIONS

This qualification has been designed and structured as part of a progressive route in the manufacturing and assembly processes industry 50 that qualifying learners can move from one level to the next. The use of generic unit standards in this qualification opens new avenues for the learner to progress from one qualification to another in related fields of study beyond fluid power. Employers or institutions should be able to evaluate the outcomes of this qualification against the needs of their context and structure top-up learning appropriately. Equally, holders of other qualifications may be evaluated against this qualification for the purpose of RPL.

This qualification leads directly to the National Certificate in Fluid Power: NQF Level 3. Learners may also decide to further their career in one of the following fields:

- Electrical engineering.
- Mechanical engineering.

Learners who have achieved this qualification have achieved generic skills that would enable them to follow a career in electrical or mechanical engineering. This qualification articulates with the following qualifications:

- National Certificate: Engineering and Related Design NQF Level 2.
- National Certificate: Introductory Mechanical Engineering NQF Level 2.
- ID 48473: National Certificate: Electrical Engineering NQF Level 2.
- ID 58722: National Certificate: Engineering Fabrication NQF Level 2.
- ID 23273: National Certificate: Mechanical Engineering: Fitting NQF Level 2.
- ID 48804: National Certificate: Occupational Safety, Hygiene and Environment NQF Level 2.

MODERA TION OPTIONS

Moderators for the qualification should be qualified and accredited with an appropriate ETQA and have a suitable qualification in engineering with a minimum of 5 years experience in fluid power.

To assure the quality of the assessment process, the moderation should cover at least one of the following:

- Assessor credentials.
- The assessment instrument.
- The assessment process.

Where assessment and moderation are taking place in sectors other than the MERSETA, assessment and moderation should be in terms of a memorandum of understanding negotiated with the MERS ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

- Appropriate qualification in the field of engineering, with a minimum of 5 years experience in the field of fluid power. The subject matter experience of the assessor can be established by recognition of prior learning.

- Appropriate experience and understanding of assessment theory, processes and practices.

- Good interpersonal skills and ability to balance the conflicting requirements of:

o Maintaining national standards.
o The interests of the learner.
o The need for transformation and redressing the legacies of the past.
o The cultural background and language of the learner.

- Registration as an assessor with the relevant ETQA.

- Any other criteria required by the relevant ETQA.

UNIT STANDARDS

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	115393	Assemble mechanical components	Level 2	12
Core	244690	Demonstrate basic knowledge of hydraulic components	Level 2	3

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	244691	Demonstrate basic knowledae of oneumatic comoonents	level 2	3
Core	244686	Demonstrate understanding of the principles of fluid power	level 2	6
Core	244688	Identifv hose and fluid oower connectors	level 2	3
Core	13136	Install, test, maintain and commission basic electrical circuits	level 2	16
Core	13238	Mark off basic enaineerina shaoes	level 2	2
Core	12215	Read, interpret and produce basic emlineerino drawinas	level 2	6
Core	119744	Select use and care for enoineerino hand tools	level 2	8
Core	12476	Select, use and care for engineering measuring equipment	level 2	4
Core	12219	Select, use and care for enaineerina power tools	level 2	6
Core	9322	Work in a team	level 2	3
Elective	116938	Use a Graphical User Interface (GUI)-based word processor to create and edit documents	Level 1	4
Elective	243069	Braze metals using the oxy-fuel brazina process	Level 2	6
Elective	13217	Collect and use information	Level 2	5
Elective	12218	Construct and test basic electronic circuits	level 2	16
Elective	12465	Develop a leamina plan and a portfolio for assessment	Level 2	6
Elective	12466	Exclain the individual's role within business	Level 2	4
Elective	13219	Maintain static seals in machines and / or equipment	Level 2	4
Elective	9268	Manaae basic personal finance	Level 2	6
Elective	12484	Perform basic fire fiahtino	Level 2	4
Elective	12483	Perform basic first aid	level 2	4
Elective	119753	Perform basic weldina/ioinina of metals	Level 2	8
Elective	12463	Understand and deal with HIV/AIDS	Level 2	3
Elective	117924	Use a Graphical User Interface (GUI)-based word processor to format documents	Level 2	5
Fundamental	119463	Access and use information from texts	level 2	5
Fundamental	9009	Apply basic knowledge of statistics and probability to influence the use of data and procedures in order to investiaate life related problems	Level 2	3
Fundamental	12461	Communicate at work	Level 2	5
Fundamental	7480	Demonstrate understanding of rational and irrational numbers and number systems	Level 2	3
Fundamental	9008	Identify, describe, compare, classify, explore shape and motion in 2-and 3-dimensional shapes in different contexts	Level 2	3
Fundamental	119454	Maintain and adapt pral/siQned communication	Level 2	5
Fundamental	7469	Use mathematics to investigate and monitor the financial aspects of personal and community life	Level 2	2
Fundamental	9007	Work with a range of patterns and functions and solve problems	Level 2	5
Fundamental	119456	Write/present for a defined context	Level 2	5

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of the principles of fluid power

SAQA USID	*UNIT STANDARD TITLE*		
244686	Demonstrate understanding of the principles of fluid power		
ORIGINATOR		*PROVIDER*	
8GB Manufacturing and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	16

SPECIFIC OUTCOME 1
Demonstrate understanding of basic physics.

SPECIFIC OUTCOME 2
Demonstrate understanding of fluids.

SPECIFIC OUTCOME 3
Demonstrate understanding of fluid flow and pressure.

SPECIFIC OUTCOME 4
Demonstrate understanding of fluid power conversion to mechanical power.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Identify hose and fluid power connectors

SAQA USID	***UNIT STANDARD TITLE***		
244688	Identify hose and fluid power connectors		
ORIGINATOR		***PROVIDER***	
5GB Manufacturing and Assembly Processes			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 2	13

SPECIFIC OUTCOME 1
Measure thread pitch.

SPECIFIC OUTCOME 2
Measure the size of a connector.

SPECIFIC OUTCOME 3
Determine sealing method of connector.

SPECIFIC OUTCOME 4
Identify standard fittings.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate basic knowledge of hydraulic components

SAQA USID	*UNIT STANDARD TITLE*		
244690	Demonstrate basic knowledae of hydraulic components		
ORIGINATOR		*PROVIDER*	
5GB Manufacturina and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturina, Engineerina and Technologv		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Reaular	Level 2	13

SPECIFIC OUTCOME 1
Demonstrate understanding of the different types of hydraulic components and their application.

SPECIFIC OUTCOME 2
Demonstrate knowledge of hydraulic circuit diagrams and symbols.

SPECIFIC OUTCOME 3
Describe the effect of various adjustments on fluid power components.

SPECIFIC OUTCOME 4
Describe safety aspects related to hydraulic systems.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate basic knowledge of pneumatic components

SAQA USID	*UNIT STANDARD TITLE*		
244691	Demonstrate basic knowledoe of pneumatic comoonents		
ORIGINATOR		*PROVIDER*	
5GB Manufacturing and Assemblv Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Reoular	Level 2	13

SPECIFIC OUTCOME 1
Explain the operation of basic air service components.

SPECIFIC OUTCOME 2
Explain the operation of pneumatic valves.

SPECIFIC OUTCOME 3
Explain the operation of pneumatic actuators.

SPECIFIC OUTCOME 4
Explain the operation of pneumatic accessories.

No. 729 17 August 2007

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the standards Generating Body (5GB) for

Assessor Standards

registered by Organising Field 05, Education, Training and Development, publishes the following Unit Standard for public comment.

This notice contains the title, field, sub-field, NQF level and credits of the Unit Standard. The full Unit Standard can be accessed via the SAQA web-site at www.saqa.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Unit Standard should reach SAQA at the address below and no *later than* 17 *September* 2007. All correspondence should be marked Standards Setting - Asseesor Standards and addressed to

The Director; Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 - 431-5144
e-mail;dmphuthing@saqa.org.za

DRS BHIKHA
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SAQA

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate knowledge and understanding of assessment in a school environment

SAQA USID	***UNIT STANDARD TITLE***		
246529	Demonstrate knowledge and understarlding of assessment in a school environment		
ORIGINATOR		***PROVIDER***	
SGB Assessor Standards			
FIELD		***SUBFIELD***	
5 - Eduoation, Trainina and Development		Schoolina	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	I ***CREDITS***
Undefined	Reaular	Level 4	13

SPECIFIC OUTCOME 1
Discuss theoretical aspects of learning and assessment as a building block for demystifying assessment.

SPECIFIC OUTCOME 2
Investigate and apply the concept of scaffolded learning to assessment practice.

SPECIFIC OUTCOME 3
Design valid assessments that promote powerful learning in authentic contexts.

SPECIFIC OUTCOME 4
Explain the role and value of meaningful feedback to learners after an assessment activity and task.

SPECIFIC OUTCOME 5
Apply knowledge of assessment practice to accommodate current departmental and irlstitutional assessment policies.

No. 730 **17 August 2007**

PUBLIC NOTICE BY ORGANISING FIELD 09, HEALTH SCIENCES AND SOCIAL SERVICES TO RE-REGISTER THE SGB FOR SOCIAL WORK

Organising Field (OF) 09 hereby gives notice of a decision to re-register the SGB for Social Work for NQF levels 4 - 8

Brief of the SGB

1. Identify transformation, development, access and equity issues relevant to social work and develop mechanisms to include these issues within the Qualifications and Standards as envisaged in (3) below *[Regulation* 24 *(1)(e)}*

2. Develop learning pathways for potential Qualifications and Unit Standards in the area of social work from NQF level 4 through to NQF level 8 *[Regulation* 24 *(1)(a)}.*

3. Generate Qualifications and Unit Standards in accordance with SAQA requirements in the area of social work in terms of requirements of relevant legislation and the establishment of best practices and ethics across the working environment *[Regulation 24 (1)(a)).*

4. Ensure that practising social workers are able to fulfil the requirements for registration with the relevant Professional Council *[Regulation* 24 *(1)(e*

5. Recommend Qualifications and Standards generated under paragraph 3 above to SAQA *[Regulation* 24 *(1)(e)].*

6. Recommend criteria for the registration of assessors and moderators or moderating bodies *[Regulation* 24 *(1)(dJ].*

7. Review these Qualifications and Unit Standards and effect the necessary changes *[Regulation* 24 *(1)(b)].*

8. Perform such other functions as may from time to time be delegated by SAQA *[Regulation* 24 *(1)(e)].*

COMPOSITION OF THE SGB

NOMINEE	WORKPLACE	NOMINATING BODY	QUALIFICATION / EXPERIENCE
Sozalek, V	University ofthe WestemCape (UWC)	UWC	• M Social SCience (Clinical Social Work) • PhD • 6 years' social work experience • 19 years' lecturina experience
Fayers, F	Health and Other Service Personnel Trade Union of SA IHOSPERSAI	S A Council for Social Service Professions (SACSSP)	• SA Social Work • 9 years' clinical experience • 7 years' experience in labour related issues • 4 Years' experience in small task teams of HWSETA
Grabbelaar, MR	National Coalition for Social Services (NACOSS)	NACOSS	• SA Social Work (Hans) • 5 years' social work experience • 15 years' training and planning experience • 10 vears' NGO administration
Harrison, E S	South African National Defence Force ISANDFI	SANDF	• M Social Work • 20 years' social work experience • 3 years lectUring experience
Hlagala, R S	National Department of Social Development IDSm	DSD	• M Social Work • 8 years' social work experience • 2 years' lecturing experience • 4 years' management experience
lombard,A	University of Pretoria;	SACSSP	• M Social Work • D Phil in Community Work & Community Development • 7 years' social work experience • 16 vears' lecturina exoerience
Prinsloo, F H	DEAFSA	DEAFSA	• MA Social Work • 32 years' social work experience - 26 of which have been with deaf communities
Pruis, S E	SACSSP	SACSSP	• M Soc Sc: Social Work • 19 years' social work experience • 10 years' lecturing and mentoring experience • 10 vears' manaaerial experience
Schenk, CJ	UNISA	UNISA	• MA Social Work: Mental Health • D Phil • 5 years' social work experience • 26 vears' leeturina experience
Sewpaul, V	University of KwaZulu-Natal (UKZN)	UKZN	• M Medical Science: Social Work • PhD • 7 years' social work experience • 21 vears' leeturina experience
Toyiya, TK	Dept of Welfare;	Nat Ed & Health Allied Workers' Union (NEHAWU)	• SA Social Work • 6 years' social work experience • 11 vears' manaaement
van Delft, W F	UNISA	UNISA	• MA (Social Work) • MA (Clinical Psychology) • D Phil • 5 years' social work experience • 36 vears' lecturina experience

No. 731 17 August 2007

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Website: www,saga.orc
Helpdesk: 086 010 3188

1 August 2007

The South African Qualifications Authority in terms of the National Standards Body Regulations (Government Gazette No. 18787) published on 28 March 1998, hereby gives notice of an additional name for the following Standards Generating Body:

SGB Diplomacy
Organising Field 08: Law, Military Science and Security

NOMINEE	WORKPLACE	NOMINATING BODY	EXPERIENCE / QUALIFICATIONS
NJ Botha	Unisa	Unisa	• Professor of International Law, Unisa • Head of Department: Constitutional, International and Indigenous Law (2000-2005) • Chair of International Law Association • B luris • LL B • LLD

DRS BHIKHA
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

No. 732 17 August 2007

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Task Team for

Weather

appointed by Organising Field 07, Human and Social Studies, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saga.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below *and no later* 16 *July 2007.* All correspondence should be marked Standards Setting - Weather and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 - 431-5144
e-mail: dmphuthing@saqa.org.za

DRS BHIKHA
DIRECTOR: STANDARDS SETIING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Cerlificate" Weather Observation

SAQA *QUALID*	I *QUALIFICATION TITLE*		
58995	National Certificate: Weather Observation		
ORIGINATOR		*PROVIDER*	
Task Team - Weather			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
National Certificate	10 - Physical, Mathematical, Computer and Life Sciences	Environmental Sciences	
ABET BAND	*MINIMUM CREDITS*	*NQFLEVEL*	*QUAL* CLASS
Undefined	120	LevelS	Regular-Unit Stds Based

PURPOSE OF THE QUALIFICATION
Purpose:

The daily work of the weather observer includes surface observations, upper air obserVations, climate station installation and inspections, climate data checking, Automatic Weather Station (AWS) installation and inspections, AWS data corrections, and the dissemination of this data into various specific coded forms. This coded data is disseminated throughout the world and picked up automatically by computers where it is used in all aspects of meteorology, for example forecasting and research, as well as the aviation industry. These codes are thus an international language used in meteorology and all Weather Observers must be familiar with and used to it. In order to be in a position to check and amend climate data, a Weather Observer must have the basic knowledge on how the atmosphere reacts to certain weather conditions.

This whole international data collection is regulated by the World Meteorological Organization (WMO) who also prescribes certain criteria to which a Weather Observer must adhere to, and thus has also suggested training material for Weather Observers, on which this Qualification is based.

Weather Observers who have achieved this Qualification will be skilled in all aspects of weather observations that are necessary to support Forecasting, Research, Aviation and Climatological specialty services within National Weather Services. It adheres to and in some cases exceeds the WMO suggested training material.

The Qualification allows for further advancement to a Level 6 Degree in the above-mentioned specialties, provided that the specified criteria for entry to Level 6 have been met.

The Qualification aims to equip learners with skills to:

- Observe all aspects of weather.
- Demonstrate how weather data is applied.
- Communicate observed weather.

Rationale:

The timeous dissemination of accurate weather observations is an international obligation for every country with a national weather service. These observations and dissemination are done strictly according to internationally recognised standards and regulations.

Nationally, these weather observations are used by local communities to plan their daily activities. In addition, these weather observations are used by more specialised industry sectors including agriculture, aviation, construction, marine and tourism. This knowledge is fundamental to the planning and operational activities of these industry sectors, These observations also form the basis of weather forecasts and related sciences. All observations are stored in data bases which are used for longer term planning and research of global weather changes.

To be able to observe weather the weather observer must know the basics of how the atmosphere functions, must be able to recognise weather phenomena, read meteorological instrumentation and record the data. The weather observer must also be able to interpret all related data in order to be able to identify problems and address them where possible.

This Qualification will ensure that the learners acquire the applied competencies and skills contained in the Exit Level Outcomes and will form the basis for further learning both within and across the sector. The Qualification is aimed at increasing levels of efficiency, effectiveness, coordination and professionalism within the weather observation sector.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
Learners accessing this Qualification will have demonstrated competence in Communication and Mathematical Literacy at NQF Level 4 or equivalent.

Recognition of Prior Learning:

The structure of this Qualification makes the Recognition of Prior Learning possible through the assessment of individual Unit Standards. This Qualification may therefore be achieved in part or in fuJl completely through the recognition of prior learning, which includes formal, informal and non-formal learning and work experience. As part of the provision of recognition of prior leaning, providers are required to develop structured means for the assessment of individual learners against the Exit Level Outcomes of the Qualification on a case by case basis. Such procedures, and the assessment of individual cases, are subject to moderation by independent assessors. The same principles that apply to assessment of this Qualification also apply to the recognition of prior learning.

The learner should be thoroughly briefed on the mechanism to be used and support and guidance should be provided. Care should be taken that the mechanism used provides the learner with an opportunity to demonstrate competence and is not so onerous as to prevent learners from taking up the recognition of prior learning option towards gaining this Qualification.

1fthe learner is able to demonstrate competence in the knowledge, skills, values and attitudes implicit in this Qualification, the appropriate credits should be assigned to the learner. Recognition of Prior Learning will be done by means of Integrated Assessment as mentioned above.

This Recognition of Prior Learning may allow:

- Accelerated access to further learning at this or higher levels on the NQF.
- Gaining of credits towards the Exit Level Outcomes.
- Obtaining this Qualification in part or as a whole.

Access to the Qualification.

There is open access bearing in mind the 'Learning assumed to be in place'.

QUALIFICATION RULES
The Qualification is made up of a combination of learning outcomes from Fundamental, Core and Elective components, totalling 120 minimum credits:

- Fundamental: 19 Credits.
- Core: 71 Credits.
- Elective (Minimum): 30 Credits.
- Total: 120 Credits.

Motivation for number of credits assigned to Fundamental, Core and Elective.

Fundamental Credits:

- There are 19 credits for the Fundamental component. All the Fundamental Unit Standards are compulsory.

Core:

- 71 credits have been allocated to the Core Unit Standards. All the Core Unit Standards are compulsory.

Electives:

- Learners must achieve a minimum 30 credits of their choice from the available Elective Unit Standards that link with their chosen career path stream.

EXIT LEVEL OUTCOMES
On achieving this Qualification, the learner will be able to:

1. Observe all aspects of weather.

2. Demonstrate an understanding of how weather data is applied.

3. Communicate observed weather.

ASSOCIATED ASSESSMENT CRITERIA
Associated Assessment Criteria for Exit Level Outcome1:

- Weather variables are recognised in order to observe weather characteristics.
- The weather formation and occurrence of weather variables is explained in order to improve weather observations.
- Coded messages are created according to World Meteorological Organisation (WMO) regulations for dissemination.

Associated Assessment Criteria for Exit Level Outcome 2:

- Research on different weather characteristics is undertaken in order to improve weather observations.
- Synoptic charts are hand plotted by using coded messages.
- Current weather situations are interpreted in order to describe current circulation patterns.

Associated Assessment Criteria for Exit Level Outcome 3:

• Weather data is disseminated nationally and internationally according to World Meteorological Organisation (WMO) regulations.
• Current observed atmospheric state is communicated to local clients.
• A basic understanding of weather is imparted to local communities.

Integrated Assessment:

The importance of integrated assessment is to confirm that the learner is able to demonstrate applied competence (practical, foundational and reflexive) and ensure that the purpose of this Qualification is achieved. Both formative and summative assessment methods and strategies are used to ensure that Exit level outcomes and the purpose of this Qualification are achieved.

Formative assessment is an on-going process which is used to assess the efficacy of the teaching and learning process. It is used to plan appropriate learning experiences to meet the learner's needs. Feedback from assessment informs both teaching and learning. If the learner has met the assessment criteria then *s/he* has achieved the Exit Level Outcomes of the Qualification.

Summative assessment is concerned with the judgement of the learning in relation to the Exit Level Outcomes of the Qualification. Such judgement must include integrated assessment(s) which test the leamer's ability to integrate the larger body of knowledge, skills and attitudes, which are represented by the Exit Level outcomes.

Integrated assessment must be designed to achieve the following:

• An integration of the achievement of the Exit Level Outcomes in a way that reflects a comprehensive approach to learning and shows that the purpose of the Qualification has been achieved.
• Judgement of learner performance to provide evidence as applied competence or capability.

INTERNATIONAL COMPARABILITY
Leaders in the field of training and development for weather observers are those countries associated with the World Meteorological Organisation. When selecting the countries in this International Comparability Study, it is noted that they were chosen, firstly, because they offer training in this area of weather observations and secondly, because they are all members of the WMO.

Training Qualifications and Courses referred to were:

United Kingdom:

The Met Office:

• Course Title: Production of aviation weather reports and METARs:
o Observe, report and encode the weather elements required for Meteorological Aviation Routine Weather Report (METAR) reports and local Air Traffic Services (ATS) reports.
o Disseminate fully coded and accurate reports within agreed timescales.
o Understand the process and criteria for issuing 'special' weather reports.
o Demonstrate the ability to make observations at night.

• Course Title: Production of semi-automated aerodrome weather reports and METARs:
o Observe, report and encode the 'visual' elements required for METAR reports and local ATS reports.
o Demonstrate a good knowledge of other elements making up METAR reports and local ATS reports.
o Disseminate fully coded and accurate reports Within agreed timescales.

o Understand the process and criteria for issuing 'special' weather reports.
o Demonstrate the ability to make observations at night.

• Course Title: ATS observer refresher training:
o Revision of the procedures used to estimate the subjective elements of the METAR.
o Update the latest coding procedures used in the production ofthe METAR.
o Enables ATS observers to maintain compliance with CAA CAP 746 standards.
o Revision of meteorological hazards.

• Course Title: Meteorological observers:
o Produce weather reports in compliance with the accuracy required by International Civil Aviation Organisation (ICAO).
o Make recommendations where necessary to ensure continued compliance.
o Weather observers competency through a range of weather scenarios.

The above courses only address the needs of the aviation sector. In most developed countries the major part of their weather observations is automated. In South Africa all weather observations are not yet fully automated and weather observers are still required to observe and record all weather variables. In this regard the National Certificate: Weather Observation, Level 5 Qualification compares favourably with the courses offered in the United Kingdom.

Australia:

Bureau of Meteorology:

• Course Title: Technical Officer (Observer):
o Surface Observations: Synoptic.
o Basic Meteorology.
o Surface Observations: Aviation.
o Climate and Consuttancy,
o Radar Observations and Hydrogen Systems.
o Meteorological Information Systems.
o Radiosonde Observations.
o First In Station Inspections (LANA).
o Field Station Simulation.
o Induction, Certificate III of Governance, Station Administration and OHS.
o First In Maintenance.
o On-The-Job Training.

The National Certificate: Weather Observation, LevelS Qualification compares favourably, although in addition the Australian course offers radar observations, consultancy and governance which are not required in this Qualification as it is only a Certificate. It should, however, be noted that the Australian course is a two year Qualification.

Kenya:

• Course Title: Meteorological Observation Techniques:
o The Atmosphere.
o Atmospheric Pressure.
o Atmospheric Temperature.
o Visibility.
o Winds.
o Humidity.
o Clouds.
o Weather.

o Evaporation.
o Climatology.
o Upper Air.
o Practical Work.

This course only addresses weather variables to be observed. The National Certificate: Weather Observation, Level 5 Qualification addresses atmospheric conditions and observations, and as a consequence, addresses much more than the above Kenyan course.

• Course Title: Middle Level Meteorological Technician Course:
o Algebra.
o Calculus.
o Trigonometry.
o Plane Analytical Geometry.
o Elementary Statistics.
o Mechanics.
o Heat.
o Optics.
o Electricity.
o Physical Meteorology.
o Dynamic Meteorology.
o Synoptic Meteorology.
o Hydro-meteorology.
o Agro-meteorology.
o Climatology.
o Meteorological Instruments.
o Introduction to Computer Applications.
o Elementary Chart Analysis.

This course addresses a number of mathematical subjects which the National Certificate: Weather Observation, Level 5 Qualification assumes as learning to be in place. It also addresses hydro-and agrometeorology which the South African Qualification does not address. The National Certificate: Weather Observation, Level 5 Qualification also addresses additional subjects in more depth than the Kenyan course.

• Course Title: Advanced Level Meteorological Technician:
o Algebra.
o Calculus.
o Trigonometry.
o Plane Analytical Geometry.
o Elementary Statistics.
o Mechanics.
o Heat and Thermodynamics.
o Optics.
o Electricity.
o Elementary Meteorology.
o Dynamic Meteorology.
o Physical Meteorology.
o Meteorological Instruments.
o Synoptic Meteorology.
o Hydro-meteorology.
o Agro-meteorology.
o Climatology.
o Meteorological Instruments.
o Remote sensing.

o Vector Analysis.
o Introduction to Computer Applications.
o Introduction to internet Facilities.
o Chart Analysis.
o Aeronautical Meteorology.
o Practical work.

This course addresses a number of mathematical subjects which the National Certificate: Weather Observation, Level 5 Qualification assumes as learning to be in place. It also addresses hydro and agrometeorology, and remote sensing which the South African Qualification does not address. The remainder of the subjects are addressed in the National Certificate: Weather Observation, Level 5 Qualification. .

• Course Title: Specialised Course in Meteorological Instruments:
o Theoretical aspects of meteorological instruments.
o Operate and work with various types of meteorological instruments.
o Meteorological instrument maintenance and calibration.
o meteorological instrument installation, workshop theory and practices.

This whole course is incorporated into the Elective Unit Standard "Manage and Maintain an Operational Weather Station". The Unit Standard covers more than the above Kenyan course.

Canada:

Canadian Armed Forces:

• Course TItle: Meteorological Technician:
o Surface weather observations.
o Recording and encoding weather data.
o Measurement of surface and upper winds.
o Operating meteorological instruments.
o Weather communications.
o Maintenance of weather equipment.

The National Certificate: Weather Observation, Level 5 Qualification compares favourably with the Canadian course as all modules are contained within the Qualification.

New Zealand:

New Zealand Qualifications Authority:

• Unit Standard Titles, Levels and Credits:
o Observe and report aerodrome weather for air traffic services; NQF Level 1; 1 Credit.
o Demonstrate basic knowledge of weather; NQF Level 1; 2 Credits.
o Access and compare weather information for outdoor recreation; NQF Level 1; 1 Credit.
o Record and communicate avalanche and weather observations; NQF Level 3; 4 Credits.
o Demonstrate knowledge of weather processes and their effects on outdoor recreation in New Zealand; NQF Level 3; 2 Credits.
o Analyse weather information and predict weather conditions for the outdoors; NQF Level 4; 3 Credits.
o Forecast, record and report weather and sea conditions; NQF Level 5; 16 Credits.

The above Unit Standards compare well with the proposed South African Qualification and associated Unit Standards. However, the National Certificate: Weather Observation, Level 5

Qualification covers a wider range of topics. The New Zealand levels differ significantly from the South African Level 5 Qualification.

All the above mentioned courses/programmes compare favourably with the National Certificate: Weather Observation, Level 5 Qualification as they are all based on the WMO standards.

ARTICULATION OPTIONS

Horizontal articulation can be found in the following Qualifications:

• ID 49053: National Certificate: Geographica/Information Sciences, NQF Level 5.
• ID 22901: National Certificate: Environmental Education, Training and Development Practice, NQF LevelS.
• ID 22902: National Diploma: Environmental Education, Training and Development Practice, NQF LevelS.

Vertical articulation can be found in the following Qualifications:

• ID 22904: Advanced Certificate: Environmental Education, Training and Development Practice, NQF Level 6.
• ID 22903: Bachelor of Environmental Education, Training and Development Practice, NQF Level 5.

MODERATION OPTIONS

• This Qualification will be internally assessed and externally moderated by a moderator registered by the relevant accredited ETQA or an ETQA that has a Memorandum of Understanding with the accredited ETQA. Providers should establish or refine existing moderation procedures and systems at their institutions with a view to aligning them with the requirements of the relevant ETQA.

• The learner's performance/results should be moderated by one or more external moderators. Moderators should report not only on the standard of achievement but also on the validity and reliability of the assessment strategies, design and criteria in relation to the purpose and Exit Level Outcomes of the Qualification.

• Moderators must be competent at one level higher than the Qualification and registered with the relevant accredited ETQA to ensure that the standard is consistent.

• Moderators must also be registered assessors with the relevant ETQA. A relevant accredited ETQA will monitor and quality assure moderation and assessment according to the guidelines in the Qualification.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

• Relevant Qualification at NQF Level 6 or higher.
• Registration as an assessor with the relevant ETQA.

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	246541	Code and decode rneteorolcqical messages	Level 5	16
Core	246539	Explain and interpret basic meteoroloaical circulations	Level 5	13
Core	246537	Explain basic meteorological concepts	Level 5	8
Core	246531	Identify and explain the formation of clouds and associated precipitation types	Level 5	14
Core	10301	Comolete a research assionment	Level 6	20
Elective	246536	Collect and interpret upper air observation data	Level 5	6
Elective	246533	Explain and analyse the interrelationship between human activities and atmospheric circulation	Level 5	10
Elective	246540	Explain and analvse the micro-climate of the urban built	Level 5	6

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
		environment.		
Elective	246534	Exolain climate variabilitv	Level 5	14
Elective	246532	Install, use and maintain automatic weather stations IAWS)	Level 5	10
Elective	246538	Manaae and maintain an ooeratlonal weather station	Level 5	16
Elective	115022	Describe research oroblems	Level 6	20
Fundamental	115792	Access, process, adapt and use data from a wide range of texts	Level 5	5
Fundamental	120304	Analvse, interoret and communicate information	Level 5	9
Fundamental	115789	Sustain oral interaction across a wide range of contexts and Critically evaluate spoken texts	Level 5	5

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Identify and explain the formation of clouds and associated precipitation types

SAQA US ID	***UNIT STANDARD TITLE***		
246531	Identify and explain the formation of clouds and associated precipitation types		
ORIGINATOR		***PROVIDER***	
Task Team - Weather			
FIELD		***SUBFIELD***	
10- Physical, Mathematical, Computer and Life Sciences		Environmental Sciences	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 5	114

SPECIFIC OUTCOME 1
Explain the processes that take place in moist air leading to the formation and dispersal of clouds.

SPECIFIC OUTCOME 2
Explain the general causes of cloud formation and resultant precipitation types.

SPECIFIC OUTCOME 3
Identify and describe the various cloud types according to their different formations.

SPECIFIC OUTCOME 4
Explain the development and nature of thunder storms.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Install, use and maintain automatic weather stations (AWS)

SAQA USID	*UNIT STANDARD TITLE*		
246532	Install, use and maintain automatic weather stations (AWS)		
ORIGINATOR		*PROVIDER*	
Task Team - Weather			
FIELD		*SUBFIELD*	
10 - Physical, Mathematical, Computer and Life Sciences		Environmental Sciences	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 5	10

SPECIFIC OUTCOME 1
Assemble automatic weather station (AWS).

SPECIFIC OUTCOME 2
Undertake full inspections of automatic weather stations (AWS).

SPECIFIC OUTCOME 3
Use the automatic weather station (AWS) operational keypad.

SPECIFIC OUTCOME 4
Conduct basic automatic weather station circuitry and sensor fault finding and repair.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Explain and analyse the interrelationship between human activities and atmospheric circulation

SAQA USID	*UNIT STANDARD TITLE*		
246533	Explain and analyse the interrelationship between human activities and atmospheric circulation		
ORIGINATOR		*PROVIDER*	
Task Team - Weather			
FIELD		*SUBFIELD*	
10- Physical, Mathematical, Computer and Life Sciences		Environmental Sciences	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Recular	Level 5	10

SPECIFIC OUTCOME 1
Explain the impact of tropical weather on human activities.

SPECIFIC OUTCOME 2
Analyse the impact of sub-tropical weather human activities.

SPECIFIC OUTCOME 3
Analyse the impact of frontal systems on cut off lows on human activities.

SPECIFIC OUTCOME 4
Explain the impact of polar circulations on human activities.

SPECIFIC OUTCOME 5
Analyse the impact of climate change in Southern Africa.

SPECIFIC OUTCOME 6
Explain the distribution of air pollution in South Africa.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Explain climate variability

SAQA USID	*UNIT STANDARD TITLE*		
246534	EXPlain climate variability		
ORIGINATOR		*PROVIDER*	
Task Team - Weather			
FIELD		*SUBFIELD*	
10 - Physical, Mathematical, Computer and Life Sciences		Environmental Sciences	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Reaular	LevelS	14

SPECIFIC OUTCOME 1
Use basic statistics in relation to climatology.

SPECIFIC OUTCOME 2
Explain and use various climate classification systems.

SPECIFIC OUTCOME 3
Explain the development of the modern atmosphere and climate variability.

SPECIFIC OUTCOME 4
Explain the ocean-atmosphere interaction and climate variability.

SPECIFIC OUTCOME 5
Explain climatic impact and applications.

SPECIFIC OUTCOME 6
Explain urban influences on climate.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Collect and interpret upper air observation data

SAQA USID	***UNIT STANDARD TITLE***		
246536	Collect and interpret upper air observation data		
ORIGINATOR		***PROVIDER***	
Task Team - Weather			
FIELD		***SUBFIELD***	
10 - Physical, Mathematical, Computer and life Sciences		Environmental Sciences	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	LevelS	16

SPECIFIC OUTCOME 1
Initialise and use upper air instruments.

SPECIFIC OUTCOME 2
Generate data according to upper air instruments.

SPECIFIC OUTCOME 3
Plot and interpret upper air data.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Explain basic meteorological concepts

SAQA USID	*UNIT STANDARD TITLE*		
246537	Explain basic rneteorolcolcal concepts		
ORIGINATOR		*PROVIDER*	
Task Team - Weather			
FIELD		*SUBFIELD*	
10 - Physical, Mathematical, Computer and Life Sciences		Environmental Sciences	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Regular	LevelS	18

SPECIFIC OUTCOME 1
Explain the different forces, motions and sources of energy that influence the earth.

SPECIFIC OUTCOME 2
Explain the properties, structure and processes in the atmosphere.

SPECIFIC OUTCOME 3
Explain the meteorological variables in the troposphere.

SPECIFIC OUTCOME 4
Explain the relationship between the wind and the energy balance in the atmosphere,

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Manage and maintain an operatIonal weather station

SAQA USID	***UNIT STANDARD TITLE***		
246538	Manaae and maintain an operational weather station		
ORIGINATOR		***PROVIDER***	
Task Team - Weather			
FIELD		***SUBFIELD***	
10 - Physical, Mathematical, Computer and Life Sciences		Environmental Sciences	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	ReauJar	LevelS	16

SPECIFIC OUTCOME 1
Explain and use various meteorological instruments.

SPECIFIC OUTCOME 2
Inspect and maintain climate and rainfall stations.

SPECIFIC OUTCOME 3
Establish a new weather camp.

SPECIFIC OUTCOME 4
Analyse climate and rainfall data for quality assurance.

SPECIFIC OUTCOME 5
Capture weather data.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Explain and interpret basic meteorological circulations

SAQA USID	*UNIT STANDARD TITLE*		
246539	Explain and Interoret basic meteoroloaical circulations		
ORIGINATOR		*PROVIDER*	
Task Team - Weather			
FIELD		*SUBFIELD*	
10 - Physical, Mathematical, Computer and Life Sciences		Environmental Sciences	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Reaular	LevelS	13

SPECIFIC OUTCOME 1
Explain how the earth's surface affects the various meteorological weather patterns.

SPECIFIC OUTCOME 2
Explain the different weather systems in relation to air mass differences.

SPECIFIC OUTCOME 3
Explain the different weather systems in mid-latitude regions.

SPECIFIC OUTCOME 4
Explain the different weather systems in tropical regions.

SPECIFIC OUTCOME 5
Explain general circulation patterns and climate regions of South Africa.

SPECIFIC OUTCOME 6
Depict and interpret basic meteorological data in the Southern Hemisphere.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Explain and analyse the micro-climate of the urban built environment.

SAQA USID	UNIT STANDARD TITLE		
246540	Explain and analyse the micro-climate of the urban built environment.		
ORIGINATOR		***PROVIDER***	
Task Team - Weather			
FIELD		***SUBFIELD***	
10 - Physical, Mathematical, Computer and Life Sciences		Environmental Sciences	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 5	16

SPECIFIC OUTCOME 1
Explain and analyse the influence of urbanisation on local climates in South African cities.

SPECIFIC OUTCOME 2
Analyse the particular relationship between the built environment and local climates in South Africa.

SPECIFIC OUTCOME 3
Describe the various design strategies and technologies of energy efficient buildings.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Code and decode meteorological messages

SAQA US ID	*UNIT STANDARD TITLE*		
246541	Code and decode meteorological messages		
ORIGINATOR		*PROVIDER*	
Task Team - Weather			
FIELD		*SUBFIELD*	
10 - Physical, Mathematical, Computer and Life Sciences		Environmental Sciences	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 5	116

SPECIFIC OUTCOME 1
Record meteorological variables according to international regulations.

SPECIFIC OUTCOME 2
Code and decode synoptic messages according to World Meteorological Organisation (WMO) formats,

SPECIFIC OUTCOME 3
Code and decode aviation based weather reports according to International Civil Aviation Organisation (ICAO) formats.

No. 733 17 August 2007

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Chemical Industries

registered by Organising Field 06 - Manufacturing, Engineering and Technology, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saga.orq.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and no *later than* 17 *September 2007.* All correspondence should be marked Standards Setting - Chemical Industries and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 - 431-5144
e-mail: dmphuthing@saqa.org.za

DRS BHIKHA
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICA"r10NS AUTHORITY

QUALIFICATION:
National Certificate" Gas Installations

SAQA QUALID	*QUALIFICATION TITLE*		
58950	National Certificate: Gas Installations		
ORIGINATOR		*PROVIDER*	
Chemical Industries 8GB			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
National Certificate	6 - Manufacturing, Engineering and Technoloqv	Manufacturing and Assembly	
ABET BAND	*MINIMUM CREDITS*	*NQFLEVEL*	*QUAL CLASS*
Undefined	120	Level 3	Regular-Unit 8tds Based

PURPOSE OF THE QUALIFICATION
Purpose:

This qualification follows on the National Certificate: Gas Installations NQF Level 2, It is used to recognise the competence of people to install a range of gas systems and perform maintenance of gas equipment in an existing or new domestic or commercial gas installation site,

Qualifying learners will:

• Understand the purpose and rationale of the organisation; the industry in which it operates and its stakeholders.
• Implement safety, health and environmental requirements in gas installations.
• Understand the purpose, application and functioning of a range of gas equipment.
• Design a gas system according to specifications,
• Perform a range of gas installation and maintenance activities.

This qualification has been designed to complete the training in gas installations for domestic or commercial gas installations although it includes the further possibility of specialising in one or more advanced gas installation applications, It also provides the basis upon which further related learning and career development can take place.

Social development and economic transformation are enhanced through efficient task performance, and career development and personal job satisfaction of installation personnel are facilitated through the learning process used to achieve the competency specified.

Rationale:

The National Certificate in Gas Installations NQF Level 3 is the final qualification in a series for learners who want to follow an independent career in gas installations and maintenance. The majority of learners for this qualification are likely to be learner-installers in small independent gas companies, After successful completion of the N.C. Gas Installations NQF Level 3, it is foreseen that the learners will eventually be able to independently run their own gas installation and maintenance operations.

This qualification will contribute to the full development of the learner within the gas installation industry by providing recognition. further mobility and transportability within the gas field. The skills, knowledge and understanding demonstrated within this qualification are essential for

social and economic transformation and contribute to the progression and economic growth within the gas installation and maintenance fraternity.

Through the employment of competent installation personnel, employers and, in turn, the field and SUb-field, have confidence that this critical work in the industry *is* efficiently carried out.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
This qualification has been designed as the final in a series of three qualifications for gas installations and maintenance in an existing or new domestic or commercial gas instaUation site.

Competence in the following is necessary:

• National Certificate: Gas Installations NQF Level 2.

Embedded knowledge upon commencement of the qualification includes:

• Language and mathematical literacy at NQF Level 2.

Recognition of Prior Learning:

Recognition of prior learning must be carried out in accordance with the policy and rules specified and used by the ETQA responsible for evaluation of people seeking RPL for a part of the whole qualification.

Access to the Qualification:

Access is open to anyone with access to learning opportunities and work experience on an appropriate selection of systems. The learning assumed to be in place is essential to the learning specified in this qualification. If the learner is not yet competent in this regard the shortfalls must be addressed prior to commencing with learning specified in this qualification. This is necessary to ensure the safety of the learner, co-workers, the work process and the environment.

Access for learners with disabilities is dependant on the:

• Type and severity of the disability.
• Nature of the operational processes and requirements of the equipment.

QUAL/FICA nON RULES
• In the compulsory Fundamental Component of the qualification, a learner must demonstrate his/her competence in the 20 credits in the field of Communication plus 16 credits in the field of Mathematical Literacy.

• The unit standards in the compulsory Core Component of the qualification reflect the skills and competencies needed for building expertise in the gas installations industry. In the Core Component, the learner must demonstrate his/her competence in the total of 60 credits.

• The Elective Component of the qualification requires the learner to select additional advanced design or equipment Unit Standards or general application Unit Standards covering life skills, computer or entrepreneurial aspects. In total the learner must demonstrate his/her competence in a minimum of 24 credits selected from the Elective component.

EXIT LEVEL OUTCOMES

When the exit level outcomes for the qualifications were developed, each critical cross-field outcome and the specific skills covered by the qualification was considered and included in the exit level outcomes for the qualification so that these outcomes reflect both in an integrated manner. In terms of process, the exit level outcomes were established first and were based on a skills profile of an operator in that field at that level.

1. Understand the purpose and rationale of the organisation, the industry in which it operates and its stakeholders.

2. Implement safety, health and environmental requirements in gas installations.

3. Understand the purpose, application and functioning of a range of gas equipment.

4. Design a gas system according to specifications.

5. Perform a range of gas installation and maintenance activities.

Critical cross-field outcomes:

While performing gas installation and maintenance functions, qualifying learners can:

1. Identify and solve problems in which response displays that responsible decisions, using critical and creative thinking, have been made by:

• Applying knowledge and comprehension of safety procedures.
o Evident in Exit Level *Outcome/s* 2, 5.
• Performing corrective maintenance of gas systems and appliances.
o Evident in Exit Level Outcome/s 5.
• Performing an inspection of a gas installation.
o Evident in Exit Level *Outcome/s* 2, 5.

2. Work effectively with others as a member of a team, group, organisation or community by:

• Working in a coordinated team during installations.
o Evident in Exit Level *Outcome/s 5.*
• Liaising with the client.
o Evident in Exit Level *Outcome/s 1.*
• Co-ordinating one's work with that of others in the direct surrounding area.
o Evident in Exit Level Outcome/s 5.

3. Organise and manage oneself and one's activities responsibly and effectively by:

• Applying knowledge of equipment to installation activities.
o Evident in Exit Level *Outcome/s* 3, 5.
• Planning and preparing for the installation.
o Evident in Exit Level *Outcome/s* 1, 2, 4 ,5.
• Performing gas installation and maintenance activities according to procedures.
o Evident in Exit Level Outcome/s 5.

4. Collect, analyse, organise and critically evaluate information by:

• Designing a gas system according to specifications.
o Evident in Exit Level Outcome/s 3, 4.
• Applying safety, health and environmental requirements to installations.
o Evident in Exit Level *Outcome/s* 2, 3.

• Commissioning the installation in accordance with legal requirements.
a Evident in Exit Level Outcome/s 1, 5.

5. Communicate effectively by using mathematical and/or language skills in the modes of oral *and/or* written presentations by:

• Demonstrating effective site protocol and client liaison.
a Evident in Exit Level Outcomels 1, 4, 5.
• Reading and interpreting drawings, specifications and building standards.
a Evident in Exit Level Outcomels 4, 5.
• Calculating costs and preparing a quotation.
a Evident in Exit Level Outcomels 4.

6. Use science and technology effectively and critically, showing responsibility towards the environment and health of others by: .

• Working according to health, safety and environmental protection regulations.
a Evident in Exit Level Outcomels 1, 2, 5.
• Applying knowledge of gas equipment to activities.
a Evident in Exit Level Outcomels 3, 4, 5.

7. Demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation by:

• Explaining the structure of the industry in which the organisation operates and the organisation's role within the industry.
a Evident in Exit Level Outcomels 1.
• Explaining the legal framework in which the industry operates.
a Evident in Exit Level Outcomels 1.
• Evaluating the quality of own work.
a Evident in Exit Level Outcomels 5.

8. Contribute to the full personal development of each learner and the social and economic development of the society at large by:

• Maintaining and applying safety practices on the worksite.
a Evident in Exit Level Outcomels 2, 5.
• Maintaining and applying quality practices during the installation.
a Evident in Exit Level Outcomels 5.
• Performing core installation functions.
a Evident in Exit Level Outcomels 5.

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level Outcome 1:

• Explain the structure of the industry in which the organisation operates and the organisation's role within the industry.
• Describe the legal framework in which the industry operates.
• Liaise with clients to arrange for quotations, installations and post-installation activities.

Associated Assessment Criteria for Exit Level Outcome 2:

• Discuss safety, health and environmental objectives, standards and regulations pertaining to installation procedures.

- Conduct safety, health and environmental inspections of a gas installation and issue an acceptance certificate.
- Employ safe working practices and report health and safety risks associated within an industrial manufacturing environment.
- Describe the environmental principles applicable to an gas installation environment.
- Take emergency action in line with emergency procedures and as may be dictated by situational considerations to ensure the safety of both personnel and equipment.

Associated Assessment Criteria for Exit Level Outcome 3:

- Explain the purpose, application and functioning of supply and storage equipment.
- Explain the purpose, application and functioning of reticulation equipment.
- Explain the purpose, application and functioning of instruments and control loops.
- Explain the purpose, application and functioning of control equipment.
- Explain the purpose, application and functioning of gas appliances and applications.

Associated Assessment Criteria for Exit Level Outcome 4:

- Use scientific methods to determine the installation.
- Define the design framework.
- Demonstrate an understanding of equipment and appliance/application selection.
- Calculate final costs and compile a quotation.
- Draw up final drawings and submit to the relevant bodies.

Associated Assessment Criteria for Exit Level Outcome 5:

- Apply knowledge of gas equipment to installation and maintenance activities.
- Plan and prepare for the installation.
- Install a complete gas system according to procedures and workplace instructions.
- Commission the installation in accordance with legal requirements.
- Independently perform maintenance functions of gas installations and equipment.
- Evaluate quality of own work.

Integrated Assessment:

The applied competence (practical, foundational and reflexive competencies) of this qualification will be achieved if a candidate is able to achieve all the exit level outcomes of this qualification.

Appropriate methods and tools must be used to assess practical, foundational and reflexive competence of the learner in all the exit level outcomes listed above, as well as to determine a learner's ability to solve problems, work in a team, organise himlherself, use applied science, and understand the implications of actions and reactions in the world as a set of related systems. Such an assessment process will determine development of the whole person, and the integration of applied knowledge and skills.

Assessors should develop, conduct, and ensure integration Of, assessment by making use of a range of formative and summative assessment methods against the unit standards that make up the qualification. Combinations of applied, foundational and reflective competencies, including critical cross-field outcomes, should be assessed wherever possible.

Moderators should ensure that assessment is valid, consistent and integrated into work or learning, and that there is sufficient and authenticated evidence of learner competence against the whole qualification.

INTERNATIONAL COMPARABILITY

An extensive international comparability was done which included the United States of America, Australia, New Zealand, Britain and relevant African countries.

United States of America:

In the USA gas installation training is generally included as a component of the construction plumbing qualification. There are 120 registered Plumber and Pipefitter Colleges and Universities in the USA where this training is done. These qualifications include understanding how to read blueprints, safely handle pipe-cutting and pipe-bending equipment, and conform to local building codes. Some specific medical gas fitting training modules are offered by private providers.

Africa and SADC:

African countries (including SADC countries) were searched for applicable qualifications or training programmes, but no relevant qualifications are offered in any of these countries.

Britain:

A comparison with the British qualification was included, because the British gas installation industry is very well developed due to a much higher demand and the NVQ is an educational structure comparable to the NQF. An internet search revealed the following British Level 2 and 3 qualifications:

• City & Guilds Level 2 NVQ in Domestic Natural Gas Installation and Maintenance. The scope of the qualification is very specific and all units are compulsory. It includes units on worksite and gas safety, teamwork and gas installation units such as Commission and de-commission domestic natural gas systems and Service and Maintain natural gas systems and components. A comparison shows that although the proposed South African qualification places equal emphasis on safety and work procedures, it has a much higher knowledge component to provide the learner with more foundational knowledge related to the properties of gases, quality and problem solving procedures.

• City & Guilds Level 3 NVQ in Domestic Natural Gas Installation and Maintenance. Compulsory units in this qualification include business improvement, safety, teamwork, natural gas system design, installation and maintenance of a range of domestic appliances. The new South African Level 3 qualification compares very well with this qualification.

• City & Guilds Level 3 Certificate in Complex Domestic Natural Gas Installation and Maintenance. Compulsory units in this qualification include business improvement, complex gas processes, a range of complex domestic gas activities such as laundry, central heating and water heating, gas pipework and metering systems. The new South African qualification contains no areas that can be compared to this qualification.

Australia:

The Australian gas installation industry is of a similar size and sophistication as the South African industry. For this reason a comparison with the Australian qualification was included, as well as the AQF being an educational structure comparable to the NQF. An internet search of the AQF revealed that there are registered qualifications in Gas Industry Operations from Levels 2 to 4 as well as a Diploma and Advanced Diploma on Levels 5 and 6 respectively.

The Certificate II in Gas Industry Operations contains compulsory core units in safety, health and environment, teamwork and the organising of work procedures. The learner is allowed a choice of elective units from the followinq three learning pathways to complete the qualification: Meter reading, LPG transport and Cylinder distribution.

These learning pathways limit the learner to the specific competencies required for these functions and the learner is not provided with the opportunity to gain any specific gas installation skills on Level 2.

The Certificate III in Gas Industry Operations allows the learner to choose between Meter repair and Billing specialisation areas. The title of this qualification is misleading because no gas installation or maintenance training is included in the qualification and as such no comparison can be made with the proposed South African qualification.

A further search of the AQF revealed a Level 3 qualification in Gas Fitting which resorts under the Plumbing and Construction fields. A range of piping and gas installation units are included with one unit dealing with the maintenance of type A gas appliances. The scope of the new South African qualification is much wider and includes a high safety and environmental protection component. organisation and industry knowledge, gas systems design, installation and maintenance.

New Zealand:

An internet search in the NZQA showed the following registered qualifications:

• A Level 2 National Certificate in Gas Industry (Gas Distribution): Similar to the new South African Level 2 qualification this entry-level qualification also contains a high knowledge component. Compulsory unit standards on safety, drawings and gas equipment and instrumentation are included. The new South African qualification differs in that it includes unit standards on problem solving and quality that are not addressed in the New Zealand qualification.

• Six Level 3 National Certificates related to the gas industry are registered on the NZQA. The scope of these qualifications range from Gas Network Operations. Gas Network Planning and Development, Gas Utilisation to Gas Transmission. No comparison with these qualifications is possible because they are very specific to the oil and gas industry and include no domestic and commercial gas installations.

• A Level 4 National Certificate in Gas Fitting. This qualification has replaced the trade certificate in Gasfrtting and qualifying learners may apply for registration as a gasfitter under the Plumbers, Gasfitters and Drainlayers Act 1976. The scope of this qualification is similar to the new NQF Level 3 qualification and includes similar core unit standards on installing and maintaining a range of domestic, commercial and industrial gas appliances and gas meters.

A comparison with the above international qualifications shows that the Gas Installation Qualification compares well with the best international qualifications and training programmes offered. The compulsory theoretical and technical content incorporated in the qualification will serve to support qualifying learners to make better informed, autonomous decisions within a more compact timeframe than international learners and will increase transportability of the qualification considerably.

ARTICULATION OPTIONS

This Level 3 qualification is the second and final in a series of two proposed gas installation qualifications and it will allow the learner a vertical progression from the NQF Level 2 Gas Installation qualification. The very specific nature of the training offered in this qualification limits the possibilities for vertical articulation into other NQF Level 4 qualifications.

Horizontal articulation within the plumbing, construction and related industries can occur with the following registered NQF Level 3 qualifications:

• ID 21853: National Certificate: Construction Plumbing, NQF Level 3.
• ID 48963: National Certificate: Air-conditioning, Refrigeration and Ventilation, NQF *Level 3.*
• ID 22310: National Certificate: Plumbing: FET Phase, NQF Level 3.
• National Certificate: Domestic Appliance Repair.

There are limited possibilities for vertical articulation into other NQF Level 4 qualifications, but on successful completion of the National Certificate: Gas Installations NQF Level 3 the learner has the following possibilities for vertical articulation into other NQF Level 4 qualifications:

• 1023953: Further.Education.Training.Certificate: New Venture Creation (SMME), NQF Level 4.

MODERATION OPTIONS
• Anyone assessing a learner or moderating the assessment of a learner against this Qualification must be registered as an assessor with the relevant ETQA.

• Any institution offering learning that will enable the achievement of this Qualification must be accredited as a provider with the relevant ETQA.

• Assessment and moderation of assessment will be overseen by the relevant ETQA according to the ETQAs policies and guidelines for assessment and moderation, in terms of agreements reached around assessment and moderation between ETQAs (including professional bodies); and in terms of the moderation guideline detailed immediately below.

• Moderation should also encompass achievement of the competence described both in individual unit standards, exit level outcomes as well as the integrated competence described in the qualification.

CRITERIA FOR THE REGISTRATION OF ASSESSORS
In order to assess this qualification, the assessor needs:

• Assessors to meet the requirements of the generic assessor standards.
• Competence against the unit standard "Conduct outcomes-based assessments".
• Detailed documentary proof of educational qualification, practical training undergone, and/or experience gained at an appropriate level in the work concerning gas installation operations. This must meet the relevant ETQA policies and guidelines. The subject matter expertise of the assessor can be established through the recognition of prior learning.
• Registration with, or recognition by, the relevant ETQA as specified through an appropriate memorandum of understanding.

NOTES
Range of equipment covered:

The typical context of this unit standard assumes an existing or new domestic or commercial gas installation site.

Range Statements:

• This qualification addresses the technical and theoretical knowledge required by learners in the gas installation and maintenance industries.
• Knowledge relating to the gas installations includes gas specific equipment and technology, communication, mathematics and SHEQ.
• This qualification may be applicable to other installation operations. This is SUbject to its acceptance by appropriate subject matter experts. .

UNIT STANDARDS

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	246447	Conduct safety, health and environmental inspections of a cas installation	Level 3	4
Core	246453	Demonstrate understanding of equipment used in gas installations	Level 3	8
Core	246458	Demonstrate understanding of the gas industry, the oroanisation and its different stakeholders	Level 3	3
Core	246454	Desion a LPG or natural cas installation.	Level 3	15
Core	246457	Identify and interpret instrument control loops in gas installations	Level 3	5
Core	245465	Implement safety, health and environmental requirements in a cas installation	Level 3	6
Core	246467	Install basic domestic or commercial oas equipment	Level 3	15
Core	246470	Perform maintenance related functions on a gas installation	Level 3	4
Elective	113924	Aoolv basic business ethics in a work environment	Level 2	2
Elective	119668	Manaoe business operations	Level 2	8
Elective	119674	Manaoe finances for a new venture	Level 2	10
Elective	119672	Manage marketing and selling processes of a new venture	Level 2	7
Elective	117923	Use a Graphical User Interface (GUIl-based presentation application to prepare and produce a presentation accordinc to a qiven brief	Level 2	5
Elective	117924	Use a Graphical User Interface (GUI)-based word processor to format documents	Levei 2	5
Elective	13915	Demonstrate knowledge and understanding of HIV/AIDS in a workplace, and its effects on a business sub-sector, own organisation and a specific workplace	Level 3	4
Elective	246455	Demonstrate understanding of LPG and natural gas svstems and equipment	Level 3	8
Elective	246492	Demonstrate understanding of advanced automotive gas svstem eouioment and svstems	Level 3	4
Elective	246485	Demonstrate understanding of basic automotive gas system equipment and svstems	Level 3	4
Elective	246491	Demonstrate understanding of gas pipeline and pipe network svstems	Level 3	4
Elective	246488	Demonstrate understanding of medical gas equipment and svstems	Level 3	6
Elective	246490	Demonstrate understanding of speciality gas installations and equipment	Level 3	4
Elective	246452	Design an advanced cas installation	Level 3	12
Elective	116714	Lead a team, plan, allocate and assess their work	Level 3	4
Elective	116940	Use a Graphical User Interface (GUI)-based spreadsheet application to solve a Diven problem	Level 3	6
Elective	114594	Apply the principles of costing and pricing to a business venture	Level 4	6
Elective	9844	Identitv customers and qenerate sellino coocrtunltles	Level 4	8
Elective	114591	Implement an action plan for business operations	Level 4	4
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	9010	Demonstrate an understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	Level 3	2
Fundamentai	9013	Describe, apply, analyse and calculate shape and motion in 2-and 3-dimensional space in different contexts	Level 3	4
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	9012	Investigate life and work related problems using data and probabilities	Level 3	5
Fundamental	119467	Use language and communication in occupational learnino oroorammes	Level 3	5
Fundamental	7456	Use mathematics to investigate and monitor the financial aspects of personal business and national issues	Level 3	5
Fundamental	119465	Write/presenVsign texts for a range of communicative contexts	Level 3	5

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Conduct safety, health and environmental inspections of a gas instal/ation

SAQA USJD	*UNIT STANDARD TITLE*		
246447	Conduct safety, health and environmental inspections of a gas installation		
ORIGINATOR		*PROVIDER*	
Chemical Industries 8GB			
FIELD		*SUBFIELD*	
6 - Manufacturino. Enoineering and Technolocv		Enqineerinc and Related Deslqn	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Regular	Level 3	14

SPECIFIC OUTCOME 1
Explain the responsibilities and liability regarding safety of a gas installation.

SPECIFIC OUTCOME 2
Prepare for safety and environmental inspections of a gas installation.

SPECIFIC OUTCOME 3
Conduct safety, health and environmental inspections of a gas installation.

SPECIFIC OUTCOME 4
Respond to inspection findings.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Design an advanced gas installation

SAQA USID	***UNIT STANDARD TITLE***		
246452	Design an advanced gas installation		
ORIGINATOR		***PROVIDER***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - Manufacturina, Engineering and Technoloav		Engineering and Related Design	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 3	12

SPECIFIC OUTCOME 1
Define the design scope of an advanced gas installation.

SPECIFIC OUTCOME 2
Select advanced appliances and design advanced applications.

SPECIFIC OUTCOME 3
Design the gas storage and delivery system for an advanced gas installation.

SPECIFIC OUTCOME 4
Design the delivery piping configuration for an advanced gas installation.

SPECIFIC OUTCOME 5
Verify the overall safety of an advanced gas installation design.

SPECIFIC OUTCOME 6
Prepare design documents.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of equipment used in gas installations

SAQA USID	***UNIT STANDARD TITLE***		
246453	Demonstrate understanding of equipment used in gas installations		
ORIGINATOR		***PROVIDER***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerina and Technoloav		Enaineerina and Related Desian	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Reaular	Level 3	18

SPECIFIC OUTCOME 1
Demonstrate an understanding of the application of pumps in gas installations.

SPECIFIC OUTCOME 2
Demonstrate an understanding of the operating principles of pumps.

SPECIFIC OUTCOME 3
Demonstrate an understanding of the application of compressors in gas installations.

SPECIFIC OUTCOME 4
Demonstrate an understanding of the operating principles of basic compressors.

SPECIFIC OUTCOME 5
Demonstrate an understanding of heat exchangers in gas installations.

SPECIFIC OUTCOME 6
Demonstrate an understanding of scales in gas installations.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Design a LPG or natural gas installation.

SAQA USID	*UNIT STANDARD TITLE*		
246454	Design a LPG or natural gas installation.		
ORIGINATOR		*PROVIDER'*	
Chemical Industries SGB			
FIELD		*SUBFIELD*	
6 - Manufacturino, Enoineerino and Technoloov		Enoineerino and Related Desion	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Regular	Level 3	15

SPECIFIC OUTCOME 1
Define the scope of the gas installation design for a basic LPG or natural gas installation.

SPECIFIC OUTCOME 2
Use scientific methods to determine a variety of typical design parameters.

SPECIFIC OUTCOME 3
Select gas appliances for a basic LPG or natural gas installation.

SPECIFIC OUTCOME 4
Design the gas storage and delivery system for a basic LPG or natural gas installation.

SPECIFIC OUTCOME 5
Design the delivery piping configuration for a basic LPG or natural gas installation.

SPECIFIC OUTCOME 6
Verify the overall safety of a basic LPG or natural gas installation design.

SPECIFIC OUTCOME 7
Prepare design documents.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of LPG and natural gas systems and equipment

SAQA USID	***UNIT STANDARD TITLE***		
246455	Demonstrate understandina of LPG and natural aas svstems and equipment		
ORIGINATOR		***PROVIDER***	
Chemical Industries SGB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technoloqv		Engineering and Related Design	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 3	18

SPECIFIC OUTCOME 1
Describe a LPG or natural gas installation configuration.

SPECIFIC OUTCOME 2
Demonstrate an understanding of different basic gas supply, delivery and control system configurations.

SPECIFIC OUTCOME 3
Demonstrate an understanding of different air delivery, ventilation and mixing system configurations.

SPECIFIC OUTCOME 4
Demonstrate an understanding of different burner, ignition and flame management system configurations.

SPECIFIC OUTCOME 5
Demonstrate an understanding of different flue configurations.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Identify and interpret instrument** control loops **in gas installations

SAQAUSID	***UNIT STANDARD TITLE***		
246457	Identifv and interpret instrument control loops in cas installations		
ORIGINATOR		***PROVIDER***	
Chemical Industries 8GB			
FfELD		***SUBFfELD***	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	***UNfT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 3	15

SPECIFIC OUTCOME 1
Describe the legislation that reflects the employer/employee relationship.

SPECIFIC OUTCOME 2
Identify piping and valves from P&IDs.

SPECIFIC OUTCOME 3
Identify equipment from P&IDs.

SPECIFIC OUTCOME 4
Explain the use of control loops in gas installations.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of the gas industry, the organisation and its different stakeholders

SAQA *USID*	*UNIT STANDARD TITLE*		
246458	Demonstrate understanding of the gas industry, the organisation and its different stakeholders		
ORIGINATOR		*PROVIDER*	
Chemical Industries 8GB			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technoloav		Engineering and Related Design	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Regular	Level 3	13

SPECIFIC OUTCOME 1
Describe the legislation that reflects the employer/employee relationship.

SPECIFIC OUTCOME 2
Explain the organisation's purpose and the environment within which it operates.

SPECIFIC OUTCOME 3
Explain the structure of the industry in which the organisation operates and the organisation's role within the industry.

SPECIFIC OUTCOME 4
Demonstrate understanding of the legal framework in which the industry operates.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Implement safety, health and environmental requirements in a gas installation

SAQA USID	***UNIT STANDARD TITLE***		
246465	Implement safety, health and environmental reauirements in a aas installation		
ORIGINATOR		***PROVIDER·***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - ManUfacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 3	16

SPECIFIC OUTCOME 1
Identify and describe basic health and safety statutory and organisational requirements.

SPECIFIC OUTCOME 2
Identify risks applicable to a gas installation environment.

SPECIFIC OUTCOME 3
Employ safe installation practices.

SPECIFIC OUTCOME 4
Describe the environmental principles applicable to a gas installation environment.

SPECIFIC OUTCOME 5
Describe and implement basic administrative safety requirements.

SPECIFIC OUTCOME 6
Describe and implement good hygiene and housekeeping practices.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Install basil: domestic or commercial gas equipment

SAQA USID	***UNIT STANDARD TITLE***		
246467	Install basic domestic or commercial cas eouloment		
ORIGINATOR		***PROVIDER***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineerina and Technoloav		Enaineerino and Related Desion	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 3	115

SPECIFIC OUTCOME 1
Plan the installation.

SPECIFIC OUTCOME 2
Liaise with third parties.

SPECIFIC OUTCOME 3
Prepare for the installation.

SPECIFIC OUTCOME 4
Conduct the installation.

SPECIFIC OUTCOME 5
Complete post-installation functions.

SPECIFIC OUTCOME 6
Commission the installation and complete required documentation.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Perform maintenance related functions on a gas installation

SAQA USID	***UNIT STANDARD TITLE***		
246470	Perform maintenance related functions on a gas installation		
ORIGINATOR		***PROVIDER***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - Manufacturina. Enaineerina and Technoloav		Enaineerina and Related Desian	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 3	14

SPECIFIC OUTCOME 1
Plan customer equipment maintenance interaction.

SPECIFIC OUTCOME 2
Localise and repair faults.

SPECIFIC OUTCOME 3
Complete equipment maintenance functions.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of basic automotive gas system equipment and systems

SAQA USID	***UNIT STANDARD TITLE***		
246485	Demonstrate understanding of basic automotive gas system equipment and systems		
ORIGINATOR		***PROVIDER***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - ManufacturinQ, EngineerinQ and Technology		EngineerinQ and Related Design	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 3	14

SPECIFIC OUTCOME 1
Describe typical automotive gas installation equipment and configurations.

SPECIFIC OUTCOME2
Describe different automotive gas storage and supply equipment and configurations.

SPECIFIC OUTCOME 3
Describe different automotive gas delivery and control equipment and systems.

SPECIFIC OUTCOME 4
Describe different automotive gas applications.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of medical gas equipment and systems

SAQA USID	***UNIT STANDARD TITLE***		
246488	Demonstrate understandina of medical gas equipment and systems		
ORIGINATOR		***PROVIDER***	
Chemical Industries 8GB			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerina and Technology		Engineerina and Related Design	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 3	16

SPECIFIC OUTCOME 1
Describe typical medical gas system installation equipment and configurations.

SPECIFIC OUTCOME 2
Describe different medical gas storage and supply equipment and configurations.

SPECIFIC OUTCOME 3
Describe different medical gas delivery and control equipment and systems.

SPECIFIC OUTCOME 4
Describe different medical gas applications.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of speciality gas installations and equipment

SAQA USID	***UNIT STANDARD TITLE***		
246490	Demonstrate understanding of specialitv aas installations and eauioment		
ORIGINATOR		***PROVIDER***	
Chemical Industries SGB			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerina and Technoloav		Engineerina and Related Desian	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Reaular	Leve/3	14

SPECIFIC OUTCOME 1
Describe typical speciality gas applications in South Africa.

SPECIFIC OUTCOME 2
Describe the equipment and configurations used in different types of speciality gas installations.

SPECIFIC OUTCOME 3
Describe different speciality gas installation delivery and control equipment.

SPECIFIC OUTCOME 4
Describe different speciality gas applications.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of gas pipeline and pipe network systems

SAQA USID	***UNIT STANDARD TITLE***		
246491	Demonstrate understanding of gas pipeline and pipe network systems		
ORIGINATOR		***PROVIDER***	
Chemical Industries SGB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	*UNIT STANDARD* ***TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 3	14

SPECIFIC OUTCOME 1
Describe typical gas pipeline applications in South Africa.

SPECIFIC OUTCOME 2
Describe typical gas pipeline and pipe network layouts and configurations.

SPECIFIC OUTCOME 3
Describe different pipeline system components.

SPECIFIC OUTCOME 4
Describe different pipeline and pipe network control equipment and systems.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate understanding of advanced automotive gas system equipment and systems

SAQA USID	***UNIT STANDARD TITLE***		
246492	Demonstrate understanding of advanced automotive gas system equipment and svstems		
ORIGINATOR		***PROVIDER***	
Chemical Industries 8GB			
FIELD		***SUBFIELD***	
6 - Manufacturino, Engineering and Technoloqv		Engineering and Related Design	
ABETBAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	I ***CREDITS***
Undefined	I Regular	Level 3	14

SPECIFIC OUTCOME 1
Describe typical advanced automotive gas installation equipment and configurations.

SPECIFIC OUTCOME 2
Describe different advanced automotive gas storage and supply equipment and configurations.

SPECIFIC OUTCOME 3
Describe different advanced automotive gas delivery and control equipment and systems.

SPECIFIC OUTCOME 4
Describe different advanced automotive gas applications.

No. 734 17 August 2007

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Chemical Industries

registered by Organising Field 06 - Manufacturing, Engineering and Technology, publishes the following Qualification and Unit Standards for public *comment.*

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saga.org.za. Copies *may* also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and *no later than* 17 *September 2007.* All correspondence should be marked Standards Setting - Chemical Industries and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 - 431-5144
e-mail: dmphuthing@saqa.org.za

DRS **BHIKHA**
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
Further Education Training Certificate: Laboratory Analysis

SAQA *QUALID*	*QUALIFICATION TITLE*		
58952	Further Education Training Certificate: Laboratory Analysis		
ORIGINATOR		*PROVIDER*	
Chemical Industries 5GB			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
Further Ed and Training Cert	6 - Manufacturing, Engineering and Technology	Manufacturing and Assembly	
ABET BAND	*MINIMUM CREDITS*	*NQF LEVEL*	*QUAL CLASS*
Undefined	140	Level 4	Regular-Unit Stds Based

PURPOSE OF THE QUALIFICATION
Purpose:

This qualification is aimed at the learner who wants to obtain the skills in laboratory analysis and will contribute/comply with quality control processes in the laboratory. It is also aimed at the learner who *already* has the mentioned skills, but wants to obtain national recognition for these competencies through a process of Recognition of Prior Learning (RPL).

The qualification provides the learner with accessibility to be employed in a laboratory environment and provides the flexibility to pursue a further career in quality assurance with broad articulation within the different areas of manufacturing and assembly, fabrication and extraction, physical sciences life sciences, environmental sciences, earth and space sciences sub-fields.

The qualification will allow the learner to gain an understanding of the implication that the laboratory test results have on the operation. And will therefore enhance the status, productivity and employability of the learner within industry as well as contribute to quality, production rate and growth. This would allow for access, progression, portability and mobility within and between the different industrial sectors.

The FETe: Laboratory Analysis will produce competent learners who are able to contribute to improved productivity and efficiency within industry. Through the employment of competent personnel, employers and the industry have confidence that this critical work in the industry is efficiently carried out.

The qualification also provides the basis upon which further related learning and career development can take place. Learners are expected to benefit by enhanced career opportunities and earning potential that will also benefit the local community and the economy.

Qualifying learners will:

Have an understanding of laboratory practice and analysis:

- Maintain and apply safety and quality practices in the relevant laboratory.
- Perform relevant routine analysis in the laboratory.
- Plan and organise own tasks and activities in relation to the laboratory's schedules and requirements.

Rationale:

The F.E.T.C. Laboratory Analysis qualification is the result of needs expressed by industry stakeholders. There is a definite need from industry (employers and employees) for a higher-level qualification in laboratory analysis to address training needs in laboratory techniques and quality assurance as well as a qualification that would provide access to the Higher Education Band and specifically laboratory analysis on NQF Level 5.

This qualification reflects the workplace-based need regarding laboratory practices, specifically towards analytical techniques in the laboratory environment. There is also a critical need in industry to identify people who are able to comprehend and conduct the essential operations associated with:

• Sample preparation and processing.
• Analysis of samples using different analytical techniques.
• Data processing, the evaluation and reporting of results within laboratories.
• Understanding and complying with laboratory occupational safety, health and environment requirements.
• Understanding the impact of the results on the business process.

The laboratory analysis industry is well established in South Africa and its success is dependant upon efficient laboratory practices. Achievement .ofthis objective is largely dependant upon the competence, recognised by this qualification, of the people who perform laboratory analysis using a range of sophisticaied instruments and equipment. An adequate number of people with these skills are needed to ensure that the production units in South Africa operate productively.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
Specific laboratory skills that must be in place upon commencement of the qualification include:

• Preparation of glassware for use in analysis.
• Handling of hazardous materials.
• Personal and laboratory safety, including fire fighting and first aid.
• Storage of chemicals in a laboratory.
• Fundamental chemical and physical reactions.
• Computer literacy (spreadsheets or word processing).
• Laboratory techniques and procedures:
o Preparation of basic reagents.
o Basic instrumental techniques and procedures.
o Use of vacuum systems (ovens, vacuum desiccators and B?chner flasks).
o Basic non-instrumental (physical) testing using tubes.
o Heating and cooling principles for the laboratory.
o Knowledge of purpose and function of the laboratory.

Embedded knowledge upon commencement of the qualification includes:

• Literacy, mathematical literacy, natural science and technology principles at NQF Level 3.

Recognition of Prior Learning:

Recognition of prior learning must be carried out in accordance with the policy and rules specified and used by the ETQA responsible for evaluation of people seeking RPL for a part of the whole qualification.

Access to the qualification:

Access is open to anyone with access to learning opportunities and work experience on an appropriate selection of systems. The learning assumed to be in place is essential to the learning specified in this qualification. If the learner is not yet competent in this regard the shortfalls must be addressed prior to commencing with learning specified in this qualification. This is necessary to ensure the safety of the learner, co-workers, the production process and the environment.

Access for learners with disabilities is dependant on the:

- Type and severity of the disability.
- Nature of the operational processes and requirements of the equipment.

QUALIFICATION RULES

In the compulsory Fundamental Component of the qualification, a learner must demonstrate his/her competence in the 20 credits in the field of Literacy in a first language at NQF Level 4, 20 credits in the field of Literacy in a second language at NQF Level 3 plus 16 credits in the field of Mathematical Literacy. In the Fundamental Component the learner must therefore demonstrate his/her competence in a total of 56 credits.

The unit standards in the compulsory Core Component of the qualification reflect the skills and competencies needed for building expertise in the laboratory environment where skills in analytical techniques, quality assurance and occupational health and safety and environment requirements are necessary. In the Core Component, the learner must demonstrate his/her competence in the total of 60 credits.

The Elective component of the qualification consists of two parts:

- Group A: Instrumentation Electives with unit standards for analytical instrumental techniques of which at least 2 Unit standards must be chosen.
- Group B: General Elective Component with a broad range of laboratory-related Unit Standards as well as administration and training related Unit Standards. The learner must choose Unit standards from this group to complete the qualification.

In total the learner must demonstrate his/her competence in a minimum of 30 credits selected from the Group A and Group B Elective Unit standards.

EXIT LEVEL OUTCOMES

When the exit level outcomes for the qualifications were developed, each critical cross-field outcome and the specific skills covered by the qualification was considered and included in the exit level outcomes for the qualification so that these outcomes reflect both in an integrated manner. In terms of process, the exit level outcomes were established first and were based on a skills profile of an operator in that field at that level.

1. Maintain and apply safety and quality practices in the relevant laboratory.

2. Perform relevant routine analysis in the laboratory.

3. Plan and organise own tasks and activities in relation to the laboratory's schedules and requirements.

Critical Cross-Field Outcomes:

Each critical cross-field outcome was considered in terms of its applicability to each of the specific outcomes for each unit standard. Where it was found to be applicable, the nature of the skills being developed was specified by the working group and captured in the standard.

Critical cross-field outcomes are assessed per unit standards and are part of all exit level outcomes.

Critical cross-field outcomes have been addressed by the exit level outcomes as follows:

While performing integrated laboratory analyses qualifying learners can:

Identify and solve problems in which response displays that responsible decisions, using critical and creative thinking, have been made by:

- Applying knowledge and comprehension of safety and quality practices.
- Evident in Exit Level Outcome 1.

- Monitoring and controlling quality assurance practices.
- Evident in Exit Level Outcome 1.

- Identifying and solving problems while performing laboratory analyses.
- Evident in Exit Level Outcome 2.

Work effectively with others as a member of a team, group, organisation or community by:

- Applying team-work to monitor and control quality assurance practices.
- Evident in Exit Level Outcome 1.

- Co-ordinating one's work with that of others in the direct surrounding area.
- Evident in Exit Level Outcome 2.

Organise and manage oneself and one's activities responsibly and effectively by:

- Planning and implementing one's own routine functions.
- Evident in Exit Level Outcome 2, 3.

Collect, analyse, organise and critically evaluate information by:

- Monitoring and controlling quality assurance practices.
- Evident in Exit Level Outcome 1.

- Analysing samples and evaluating the results.
- Evident in Exit Level Outcome 2.

- Validating and verifying analytical data.
- Evident in Exit Level Outcome 1.

- Managing records, reports and stock.
- Evident in Exit Level Outcome 3.

Communicate effectively by using mathematical and/or language skills in the modes of oral and/or written presentations by:

- Recording and interpretation of instrument readings.
- Evident in Exit Level Outcome 2.

• Keeping records and noting results
• Evident in Exit Level Outcome 2, 3.

• Preparing and presenting reports.
• Evident in Exit Level Outcome 3.

Use science and technology effectively and critically, showing responsibility towards the environment and health of others by:

• Working according to health and safety regulations.
• Evident in Exit Level Outcome 1, 3.

• Working with analytical instrumentation according to Standard Operating Procedures.
• Evident in Exit Level Outcome 2.

Demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation by:

• Monitoring and controlling quality assurance practices.
• Evident in Exit Level Outcome 1.

• Identifying and solving problems while performing laboratory analyses.
• Evident in Exit Level Outcome 1, 2.

Contribute to the full personal development of each learner and the social and economic development of the society at large by:

• Maintaining and applying safety and quality practices in the laboratory.
• Evident in Exit Level Outcome 1.

• Performing routine analyses in the laboratory.
• Evident in Exit Level Outcome 2, 3.

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level Outcome 1:

• Apply procedures to ensure occupational safety, health and environmental protection according to the organisation's quality management and safety policy.
• Validate and verify input elements (e.g. equipment, reagents, procedures, etc.) for analytical procedures.

Associated Assessment Criteria for Exit Level Outcome 2:

• Apply chemical and physical principles during analytical procedures in the laboratory in accordance with standard operating procedures.
• Perform routine analysis according to standard operating procedures and report the results.
• Prepare and verify analytical or reference standard material for quantitative analytical measurements in the laboratory according to applicable legislation and company specifications.
• Demonstrate knowledge of the role and processes of the laboratory in the related industry.

Associated Assessment Criteria for Exit Level Outcome 3:

• Maintain administrative records according to the organisation's quality management system.

• Prepare and present reports on laboratory analyses according to the organisation's quality management system.
• Maintain consumable stock levels for own routine analyses in accordance with organisational requirements.
• Maintain operational levels of equipment for own area of responsibility in accordance with organisational requirements.

Integrated assessment:

The applied competence (practical, foundational and reflexive competencies) of this qualification will be achieved if a candidate is able to achieve all the exit level outcomes of this qualification.

Appropriate methods and tools must be used to assess practical, foundational and reflexive competence of the learner in all the exit level outcomes listed above, as well as to determine a learner's ability to solve problems, work in a team, organize him/herself, use applied science, and understand the implications of actions and reactions in the world as a set of related systems. Such an assessment process will determine development of the whole person, and the integration of applied knowledge and skills.

Assessors should develop, conduct, and ensure integration of, assessment by making use of a range of formative and summative assessment methods against the unit standards that make up the qualification. Combinations of applied, foundational and reflective competencies, including critical cross-field outcomes, should be assessed wherever possible.

Moderators should ensure that assessment is valid, consistent and integrated into work or learning, and that there is sufficient and authenticated evidence of learner competence against the whole qualification.

INTERNATIONAL COMPARABILITY

An extensive international comparability was done which included the United States of America, Australia, New Zealand, Germany, Britain and relevant African countries.

Africa:

African countries with laboratory facilities (including SADC countries) were scanned for applicable qualifications or training programmes and the chairperson of the CISGB, Delysia Timm, contacted a range of laboratory-related people in the context of Africa as a whole. The only response received was from Dr Rhonest Ntayia, Head of KEPHIS Analytical Laboratories in Nairobi, Kenya (laboratories@kephis.org.).

From his response and further research it has been found that the training offered to learners in Eastern and Central Africa by KEPHIS Analytical Laboratories in Nairobi, Kenya is regarded as world-class and the organisation has a good reputation for training delivery. The training programmes offered by KEPHIS include training on equipment repair, servicing and maintenance, analytical sampling techniques, health and safety, quality assurance. The content and purpose of the F.E.T.C: Laboratory Analysis compares well with what is offered by KEPHIS.

Britain:

A comparison with the British qualification was included, because the British laboratory systems are very well developed and the NVQ is an educational structure comparable to the NQF. An internet search revealed that the NQF Level 4 NVQ in Laboratory and Associated Technical Activities consists of mandatory and optional units.

The mandatory units include occupational health and safety, teamwork, quality and work organisation. The learner is allowed to choose from optional units that range from self-

management, financial management, writing technical reports, investigations and small scale processing to running technical projects and teaching activities. It is clear that the emphasis of this qualification is not on laboratory analysis and practice using advanced instrumentation as is the case with the new South African qualification.

Australia:

A comparison with the Australian qualification was included because the AQF is an educational structure comparable to the NQF and the Australian approach to laboratory practice seems to be similar to the South African approach. An intemet search of the AQF revealed that the Australian Certificate III and IV (Laboratory Skills and Laboratory Technology respectively) are registered on the AQF. There are no relevant registered qualifications in the lower levels. In each level there are 5 compulsory core units in communication, safety, quality and work procedures and the learner is allowed a choice of between 7 (level 3) and 11 (level 4) elective unit standards in domains comparable to the local qualification, e.g. laboratory practice, performing basic tests, calibrations, a range of sampling units, medical and pathological laboratory procedures, maintaining and controlling stocks, routine instrumentation units, etc.

From this analysis it is clear that the proposed South African qualification places a greater emphasis on the use of advanced instrumentation in the laboratory environment, although the unit standards in the core component are similar to those of the NQF Level IV Australian qualification.

New Zealand:

A comparison with the New Zealand qualification was included because the NZQA is an educational structure comparable to the NQF. The research in the NZQA showed that the New Zealand Qualifications Authority has registered the following related qualifications:

- NC Dairy Manufacturing (Lab Technology) NQF Level 4.
- National Diploma in Lab Animal Care.

Certain generic unit standards in both qualifications relating to laboratory techniques compare well with the choice of generic standards in this qualification e.g. coaching, basic principles of High Performance Liquid Chromatography, chromatography, and wastewater monitoring. Other standards were too specific with regard to the context and scope for comparisons to be done.

The following unit standards registered by the NZ authority also relates directly to this qualification:

- JD 8440: "Comply with laboratory quality management systems" NQF Level 5, (4 credits) compares well with SAQA Unit standard **110464** at level 5 (8 credits), "Monitor the quality system in the laboratory".
- ID 8436 "Perform laboratory solvent and distillation separation techniques" at NQF Level 4, (3 credits) has procedures and competencies contained in a number of standards in the core of this qualification.

The majority of the other standards on the New Zealand Qualifications Authority apply directly to dairy, electrical, film, animal and food laboratories.

USA:

An internet search of USA sites revealed a number of courses and programmes, which are not outcomes based. They are:

- Acid fast Direct Smear Microscopy.

• Use of flurochrom staining for detecting acid fast mycobacteria, a programme designed for public health and clinical laboratory personnel.
• Assuring the quality of laboratory testing in countries fighting an HIV/AIDS epidemic.

A course called, Laboratory Training Experience, was found during the USIDNET search. The programme however is for learning in the field of Primary Immune Deficiency Diseases, so is not applicable.

The above courses and programmes contain similar laboratory process content as this South African qualification, but they were applicable to various other unrelated contexts.

Summary:

The F.E.T.C. Laboratory Analysis Qualification compares well with the best international qualifications and training programmes offered. The core and elective content incorporated in the qualification will serve to support qualifying learners to make better informed, autonomous decisions within a more compact timeframe than international learners and will increase transportability of the qualification considerably.

It can be stated that this qualification includes much of the learning that is offered in all similar courses, programmes/qualifications offered internationally. It would be fair to say therefore that this qualification compared favourably with those chosen in this benchmark exercise.

ARTICULATION OPTIONS
The learner will be allowed vertical progression from the following NQF Level 3 qualifications:

• ID 50305: National Certificate: Food Laboratory Analysis, NQF Level 3.
• ID 20212: National Certificate: Food Laboratory Practice (Dairy Laboratory Analyst), NQF Leve.! 3.

Horizontal articulation possibilities within the laboratory practice industry are very limited because of the specific nature of the industry, but horizontal articulation can occur with the following registered NQF Level 4 qualifications:

• Certificate: Chemical Laboratory Assistant.

The generic knowledge and expertise enables the learner to progress vertically in a range of other laboratory and quality assurance-related qualifications or to develop a career where knowledge of laboratory practice is necessary.

Vertical articulation exists with, for example:

• Certificate: Quality Management, NQF Level 5.
• ID 50334: National Diploma: Occupationally Directed Education, Training and Development Practices NQF Level 5.
• National Certificate: Analytical Chemistry, NQF Level 5.
• National Higher Certificate: Analytical Chemistry, NQF Level 5.
• Diploma: Analytical Chemistry, NQF Level 5.

MODERATION OPTIONS
• Anyone moderating the assessment of learners against this Qualification must be registered as a moderator with the relevant ETQA.

• Any institution offering learning that will enable the achievement of this Qualification must be accredited or recognised as a provider with the relevant ETQA.

• Assessment and moderation will be overseen by the relevant ETQA according to the ETQAs policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQAs (including professional bodies); and in terms of the moderation guideline detailed immediately below.

• Moderation must include both internal and external moderation of assessments at exit points of the qualification, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described both in individual unit standards, exit level outcomes as well as the integrated competence described in the qualification.

• Anyone wishing to be assessed against this Qualification may apply to be assessed by any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

In order to assess this qualification, the assessor needs:

• Well developed interpersonal skills.
• Assessors to meet the requirements of the generic assessor standards.
• Competence against the unit standard "Conduct outcomes-based assessments".
• Detailed documentary proof of educational qualification, practical training undergone, and/or experience gained at an appropriate level in the work concerning laboratory practice. This must meet the relevant ETQA policies and guidelines. The subject matter expertise of the assessor can be established through the recognition of prior learning.
• Registration with, or recognition by, the relevant ETQA as specified through an appropriate memorandum of understanding.

NOTES

• This qualification addresses the theoretical and practical knowledge required by learners in laboratory analysis.
• Knowledge relating to laboratory practice includes industry-specific instruments and technology, communication, mathematics, applied science, and SHEQ.
• This qualification may be applicable to other laboratory applications. This is subject to its acceptance by appropriate subject matter experts.

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	110421	Maintain slack levels of equipment, reagents and consumbles required by the laboratory	Level 4	12
Core	13224	Monitor the application of safety, health and environmental orotection orocedures	Level 4	4
Core	246451	Perform aravimetric analvses	Leyel4	6
Core	9627	Perform tilrimetric analvsis	Leyel4	3
Core	110204	Prepare and yerify standards for quantitative analytical measurements	Level 4	11
Core	246436	Understand and apply chemicalprinciples	Level 4	8
Core	246438	Understand and apply principles of physics	Level 4	8
Core	110464	Monitor the auality system in the laboratory	LevelS	8
Elective	110169	Separate solids from a liouid bv means of filtration	Level 2	3
Elective	110382	Determine the calorific value of a substance	Level 3	5
Elective	9637	Determine the conductance of a liquid by means of a Conductivity meter	Level 3	2
Elective	9628	Determine the gold fineness of gold bullion by the re-inquartatlon and partina procedure	Level 3	4
Elective	9636	Determine the pH of a liauid by means of a pH meter	Level 3	2
Elective	9747	Determine the precious metal content of an assayed sample bv hiah temoerature cuoellation and welchino	Level 3	7
Elective	110431	Determine the presence of bacteria in.samples	Level 3	3
Elective	9742	Dissolve solid samples for analysis	Level 3	S
Elective	117877	Perform one-to-one trainina on the lob	Level 3	4

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	**110119**	Quantify Sulphur and Ior carbon by means of a combustion furnace and titration method	Level 3	5
Elective	9630	Quantify analyte concentrations in prepared samples by means of Flame Atomic Absorption Spectroscopy	Level 3	15
Elective	9751	Quantify analyte concentrations in prepared samples by means of Ultraviolet-Visible Soectroohotometrv	Level 3	6
Elective	246435	Analyse samples quantitatively by means of X-ray spectrometry (Aztec)	Level 4	5
Elective	110378	Determine the composition of a substance by Gas Chromatooraohv IGCl	Level 4	13
Elective	110201	Determine the concentration of a substance by Ion Chromatoaraohy IICl	Level 4	13
Elective	246462	Detenmine the microbiological quality of samples in a laboratorv environment	Level 4	8
Elective	123281	Evaluate the microbiological quality of a food product as indicated by the presence of the pathogens Staohvlococcus eureusts.eureue) and Salmonella	Level 4	6
Elective	11038	Identify and quantify the petrographic characteristics of coal materials bv means of a microscope	Level 4	13
ElectiYe	110009	Manaae administration records	Level 4	4
Elective	246456	Perform intermediate non-instrumental (physical) testing in a laboratorv environment	Level 4	8
Elective	110388	Quantify analyte concentrations in prepared samples by hiah performance liauid chrcrnatocraohv rHPLCl	Level 4	13
Elective	9750	Quantify analyte concentrations in prepared samples by means of Graphite Furnace Atomic Absorption Spectroscoov	Leyel4	3
Elective	9748	Quantify analyte concentrations in prepared samples by means of Inductively Coupled Plasma Optical Emission Soectrometrv	Level 4	12
Elective	246432	Quantify analyle concentrations in prepared samples by means of Infrared Spectrophotometry	Level 4	3
Elective	246439	Quantify analyte concentrations in prepared samples by means of hydride generation atomic absorption scectrcscoov	Level 4	11
Elective	9743	Quantify analyte concentrations in prepared solid samples by means of Emission Spectroscopy	Level 4	12
Elective	9749	Quantify analyle concentrations in samples by means of X-RaY Fluorescence Soectrometrv	Level 4	g
Elective	11033	Quantify anaMe content bv precipitation aravimetrv	Level 4	5
Elective	246434	Validate and verify analvlical data	Level 4	6
Elective	115753	Conduct outcomes-based assessment	Level 5	15
Elective	10631	Demonstrate an understanding of manufacturing, principles, methodolooies and orocesses	Level 5	7
Elective	110425	Demonstrate knowledge required to effectively monitor· water cuantv	Level 5	4
Elective	246433	Perform advanced Instrumental techniques in a laboratory environment	Level 5	10
Elective	246444	Reduce samples or material by means of hydrogen reduction	Level 5	3
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	119457	Interpret and use infonmation from texts	Level 3	5
Fundamental	119467	Use language and communication in occupational leamino nrocrarnmes	Level 3	5
Fundamental	119465	Write/presenVsign texts for a range of communicative contexts	Level 3	5
Fundamental	9015	Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related oroblems	Level 4	6
Fundamental	119462	Engage in sustained oral/signed communication and evaluate sooken/sianed texts	Level 4	5
Fundamental	119469	Readlview, anatvse and respond to a variety of texts	Leyel4	5
Fundamental	9016	Represent analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts	Level 4	4
Fundamental	7468	Use mathematics 10investigate and monitor the financial asoects of personal, business, national and international	Level 4	6

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
		issues		
Fundamental	12153	Use the writing process to compose texts required in the business environment	level 4	5
Fundamental	119459	Write/present/sign for a wide ranee of contexts	Level 4	5

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Quantify analyte concentrations in prepared samples by means of Infrared Spectrophotometry

SAQA USID	***UNIT STANDARD TITLE***		
246432	Quantify analyte concentrations in prepared samples by means of Infrared Soectroohotometrv		
ORIGINATOR		***PROVIDER***	
Chemical Industries SGB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 4	13

SPECIFIC OUTCOME 1
Demonstrate understanding of Infrared Spectrophotometry.

SPECIFIC OUTCOME 2
Prepare to quantify analyte concentration in prepared samples.

SPECIFIC OUTCOME 3
Analyse samples by means of Infrared Spectrophotometry.

SPECIFIC OUTCOME 4
Report results of the Infrared Spectrophotometry.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Perform advanced instrumental techniques in a laboratory environment

SAQA USID	***UNIT STANDARD TITLE***		
246433	Perform advanced instrumental techniques in a laboratory environment		
ORIGINATOR		***PROVIDER***	
Chemical Industries 8GB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 5	110

SPECIFIC OUTCOME 1
Demonstrate an understanding of advanced instrumental techniques in a laboratory environment.

SPECIFIC OUTCOME 2
Prepare for advanced instrumental techniques.

SPECIFIC OUTCOME 3
Perform advanced instrumental techniques.

SPECIFIC OUTCOME 4
Report on the results of the advanced instrumental techniques.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Validate and verify analytical data

SAQA USID	***UNIT STANDARD TITLE***		
246434	Validate and verify analytical data		
ORIGINATOR		***PROVIDER***	
Chemical Industries 8GB			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerina and Technolocv		ManufacturinQ and Assembly	
ABETBAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	" Regular	Level 4	16

SPECIFIC OUTCOME 1
Gather evidence for the validation and verification of analytical data.

SPECIFIC OUTCOME 2
Represent, analyse and interpret analytical data.

SPECIFIC OUTCOME 3
Use evidence to validate and verify analytical data.

SPECIFIC OUTCOME 4
Record and report on the accuracy and validity of analytical data.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Analyse samples quantitatively by means of X-ray spectrometry (Aztec)

SAQA *USID*	***UNIT STANDARD TITLE***		
246435	Analyse samples quantitatively by means of X-ray spectrometry (Aztec)		
ORIGINATOR		***PROVIDER***	
Chemical Industries SGB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABETBAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 4	15

SPECIFIC OUTCOME 1
Demonstrate understanding of quantitative X-ray Fluorescence (Aztec) analysis.

SPECIFIC OUTCOME 2
Apply knowledge of the Aztec technique to laboratory activities.

SPECIFIC OUTCOME 3
Analyse samples quantitatively by means of X-ray Spectrometry.

SPECIFIC OUTCOME 4
Report results of the X-ray Spectrometry.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Understand and apply chemical principles

SAQA USID	***UNIT STANDARD TITLE***		
246436	Understand and apply chemical principles		
ORIGINATOR		***PROVIDER***	
Chemical Industries SGB			
FIELD		***SUBFIELD***	
6 - Manufacturina, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 4	18

SPECIFIC OUTCOME 1
Understand and apply principles of redox reactions and equations.

SPECIFIC OUTCOME 2
Understand and apply principles of acid-base reactions and equations.

SPECIFIC OUTCOME 3
Demonstrate understanding of common gases.

SPECIFIC OUTCOME 4
Understand and apply concepts of concentration.

SPECIFIC OUTCOME 5
Understand and apply principles of chemical rate, mechanism and equilibrium.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Understand and apply principles of physics

SAQA USID	***UNIT STANDARD TITLE***		
246438	Understand and apply principles of physics		
ORIGINATOR		***PROVIDER***	
Chemical Industries 8GB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Enaineerina and Technology		Manufacturing and Assembly	
ABETBAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 4	18

SPECIFIC OUTCOME 1
Understand and apply the scientific concepts of physics related to work, energy and power.

SPECIFIC OUTCOME 2
Understand and apply the properties of light.

SPECIFIC OUTCOME 3
Demonstrate an understanding of the phases and properties of substances,

SPECIFIC OUTCOME 4
Understand and apply the principles of the gas laws.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Quantify analyte concentrations in prepared samples by means of hydride generation atomic absorption spectroscopy

SAQA USID	***UNIT STANDARD TITLE***		
246439	Quantify analyte concentrations in prepared samples by means of hydride generation atomic absorption spectroscopy		
ORIGINATOR		***PROVIDER***	
Chemical Industries SGB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 4	11

SPECIFIC OUTCOME 1
Demonstrate understanding of Hydride Generation Atomic Absorption Spectroscopy.

SPECIFIC OUTCOME 2
Prepare to quantify analyte concentration in prepared samples.

SPECIFIC OUTCOME 3
Analyse samples by means of Hydride Generation Atomic Absorption Spectroscopy.

SPECIFIC OUTCOME 4
Report results of the Hydride Generation Atomic Absorption Spectroscopy.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Reduce samples or material by means of hydrogen reduction

SAQA USID	***UNIT STANDARD TITLE***		
246444	Reduce samples or material by means of hydrogen reduction		
ORIGINATOR		***PROVIDER***	
Chemica/Industries 8GB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technoloav		Manufacturina and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 5	13

SPECIFIC OUTCOME 1
Demonstrate knowledge and skills relating to occupational health, safety and environmental protection standards.

SPECIFIC OUTCOME 2
Demonstrate understanding relating to the reduction of samples or material by hydrogen.

SPECIFIC OUTCOME 3
Reduce samples or material by hydrogen.

SPECIFIC OUTCOME 4
Explain or deal with problems relating to the reduction of samples or material by hydrogen.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Perform gravimetric analyses

SAQA *US ID*	***UNIT STANDARD TITLE***		
246451	Perform gravimetric analyses		
ORIGINATOR		***PROVIDER***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - Manufacturina, Enaineerina and Technoloav		Manufacturina and Assemblv	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 4	16

SPECIFIC OUTCOME 1
Demonstrate an understanding of gravimetric analyses in a laboratory environment.

SPECIFIC OUTCOME 2
Prepare for gravimetric analyses.

SPECIFIC OUTCOME 3
Perform gravimetric analyses.

SPECIFIC OUTCOME 4
Report on the results of the gravimetric analyses.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Perform Intermediate non-instrumental (physical) testing in a laboratory environment

SAQA USID	***UNIT STANDARD TITLE***		
246456	Perform intermediate non-instrumental (physical) testing in a laboratory environment		
ORIGINATOR		***PROVIDER***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	ReQular	Level 4	18

SPECIFIC OUTCOME 1
Demonstrate an understanding of intermediate non-instrumental (physical) testing in a laboratory environment.

SPECIFIC OUTCOME 2
Prepare for intermediate non-instrumental (physical) testing.

SPECIFIC OUTCOME 3
Perform intermediate non-instrumental (physical) testing.

SPECIFIC OUTCOME 4
Report on the results of the intermediate non-instrumental (physical) testing.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Determine the microbiological quality of samples in a laboratory environment

SAQA USID	***UNIT STANDARD TITLE***		
246462	Determine the microbioloaical qualitv of samples in a laboratory environment		
ORIGINATOR		***PROVIDER***	
Chemical Industries 5GB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABETBAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 4	18

SPECIFIC OUTCOME 1
Demonstrate an understanding of microbiological tests on samples in a laboratory environment.

SPECIFIC OUTCOME 2
Prepare for microbiological tests on samples in a laboratory environment.

SPECIFIC OUTCOME 3
Perform microbiological tests.

SPECIFIC OUTCOME 4
Report on the results of the microbiological tests.

No. 735 17 August 2007

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Water Sector

registered by Organising Field 12, Physical Planning and Construction, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saga.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and no *later* 17 *September 2007.* All correspondence should be marked Standards Setting - Water Sector addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 - 431-5144
e-mail: dmphuthing@saqa.org.za

DRS BHIKHA
DIRECTOR: STANDARDS SETIING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Certificate: Water and Wastewater Treatment Process Operations

SAQA QUALID	*QUALIFICATION TITLE*		
58951	National Certificate: Water and Wastewater Treatment Process Operations		
ORIGINATOR		*PROVIDER*	
SGB Water Sector			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
National Certificate	12 - Physical Planning and Construction	Civil Engineering Construction	
ABET BAND	*MINIMUM CREDITS*	*NQF LEVEL*	*QUAL CLASS*
Undefined	130	Level 2	Regular-Unit Stds Based

PURPOSE OF THE QUALIFICATION
Purpose:

This qualification is aimed at persons who work or intend to work in the water and wastewater treatment plant and who seek recognition for essential skills in water and wastewater treatment works. This qualification will provide learners with a basic knowledge and understanding of the water and wastewater treatment works. Qualifying learner will be able to operate processes at a water and wastewater treatment works in line with the relevant legislation within the water sector. The qualifying learner will understand the implications on cost, health and the environmental conservation of water. This qualification forms the foundation for advancement or progression to the highest levels within the qualification leaming pathways.

Qualifying learners will be competent in:

• Applying fundamental knowledge and understanding of current legislation specific to water and wastewater treatment.
• Operating processes at a water and wastewater treatment works.
• Demonstrating an understanding and knowledge of equipment to be used to perform water and wastewater treatment works.
• Communicating with team workers for effective shift take-over and hand-over.

Rationale:

This qualification reflects the workplace-based needs of water and wastewater process operators working in the water sector that are expressed by employers and employees, both now and for the future. The introduction of a National Certificate in Water and Wastewater Process Operations on NQF Level 2 provides the leamer with a career path in water and wastewater processes with skills specific to the operation of processes of a water and wastewater treatment works and progression to a National Certificate in Water and Wastewater Process [senior operator) on NQF Level 3 (which will provide the skills necessary for the supervision of a water and wastewater treatment works).

This qualification will enable learners to reach their potential of advancement without the lack of formal education being an impassable barrier. In addition, the qualification will provide access to employment opportunities within the water sector, together with the flexibility to pursue different careers other related sectors such as pollution control, wet industries, electricity generation,

environmental qualifications and will allow for advancement through the recognition of prior learning.

This qualification also focuses on the development of the learner and further mobility and transportability within the water sector. It has been developed to assist with standardisation across the water purification industry and to permit learners, through several common unit standards, to access the complementary Wastewater Process Operation qualification with valuable employment potentials. This qualification will enhance productivity within the water sector, improve the health of communities and contribute towards the ecological sustainability and improvement of the water environment. The individual will have the capacity to advance and gain skills and self- confidence.

RECOGNIZE PREVIOUS LEARNiNG?
Y

LEARNING ASSUMED IN PLACE
It is assumed that the learner is competent in:

- Communication at NQF Level 1.
- Mathematical Literacy at NQF Level 1.

Recognition of Prior Learning:

This qualification may be achieved in part or completely through the recognition of prior learning, which includes formal, informal and non-formal learning and work experience. Any learner wishing to be directly assessed may arrange to do so, without attending further training or education. The assessor and learner will decide together on the most appropriate assessment route to be taken.

Access to the qualification:

Access to this qualification is open bearing in mind learning assumed to be in place.

QUALIFICATION RULES
Fundamental:

- All the unit standards in the fundamental component to the value of 36 credits are compulsory.

Core:

- All the unit standards in the core component to the value of 65 credits are compulsory.

Electives:

- Learners must choose a minimum of 18 credits from the elective,

The elective unit standards are clustered to provide areas of specialisation within the water and wastewater domains. Learners choosing an area of specialisation must complete all unit standards listed within that area of specialisation. Additional credits to the value of 11 should be selected from the generic cluster to make up 130 credits in order for the learner to obtain the qualification.

Specialisation Area A:

Water Treatment Process Operations:

Elective:

• 10246450: Demonstrate knowledge of water treatment process, Level 2, 8 Credits.
• **10246440:** Operate coagulation, flocculation and sedimentation processes, Level 2, 10 Credits.

Total Credits: 18.

Specialisation Area 8:

Wastewater Treatment Process Operations:

Elective:

• 10 246469: Operate primary settling processes in wastewater treatment, Level 2, 5 Credits.
• 10246468: Operate inlet works, Level 2, 5 Credits.
• 10 246460: Demonstrate basic knowledge of the wastewater treatment process, Level 2, 8 Credits.

Total Credits: 18

Specialisation Area C:

Generic:

Electives:

• 10 116534: Carry out basic first aid treatment in the workplace, Level 3, 2 Credits.
• ID 246486: Operate water recovery unit, Level 2, 4 Credits.
• 10116932: Operate a personal computer system, Level 1, 3 Credits.
• 10246448: Operate rotating biodisc contactor Level 2, 2 Credits.
• 10246445: Operate a biological trickling filter, Level 2, 4 Credits.
• 10246446: Operate a rapid gravity filtration process, Level 3, 5 Credits.
• 10246437: Demonstrate knowledge of activated sludge processes in wastewater treatment, Level 3, 6 Credits.
• 10 246441: Maintain maturation and oxidation ponds, Level 1, 2 Credits.
Total Credits: 28.

EXIT LEVEL OUTCOMES
On achieving this qualification the qualifying learner will be able to:

1. Apply fundamental knowledge and understanding of current legislation specific to water and wastewater treatment.

2. Operate processes at a water and wastewater treatment works.
• Range: Processes refer but not limited to processes of coagulation, flocculation and sedimentation processes; operating a sand filter, a pump, water chemical dosing system and operating water recovery unit and disposing of sludge.

3. Demonstrate an understanding and knowledge of equipment to be used to perform water and wastewater treatment works.

4. Communicate with team workers.
• Range: To ensure smooth shift-take over and handover.

Critical Cross-Field Outcomes:

The qualifying learner will be able to:

• The learner is capable of identifying water and wastewater related problems and creatively to find trouble-shooting solutions.
• Work effectively with others as a member of a team on a daily basis to effectively produce potable water.
• Organise and manage oneself and one's activities responsibly and effectively to implement effective and efficient running of the water and wastewater treatment works.
• Communicate effectively using appropriate verbal and nonverbal skills to ensure a smooth shift take-over and hand-over and reporting all work related issues.
• Demonstrate an understanding of the world, as a set of related systems by recognising that problem solving in the context of water and wastewater does not happen in isolation.
• Use science and technology to show responsibility towards the environment and health of the broader community.

ASSOCIATED* ASSESSMENT *CRITERIA

Associated Assessment Criteria for Exit level 1:

• Knowledge of current regulatory framework is demonstrated by assessing the quality of water treated.
• Knowledge of the Occupational Health and Safety Act is demonstrated and applied to personal safety in a water and wastewater environment.
• Water and wastewater treatment processes are implemented in line with legal requirements.
• The implications of the current environmental legislation on water and wastewater treatment are explained in own work context.

Associated Assessment Criteria for Exit level 2:

• Water is treated to the required standard for drinking water.
• Laboratory tests are conducted to verify and optimise the performance of water purification treatment works.
o Range: Designed test refers to but is not limited to cascade, jar test, and settling test.
• Purified water is pumped to the bulk reservoir for distribution purposes.

Associated Assessment Criteria for Exit level 3:

• Equipment and components of a sand filter are identified and applied in terms of their functions.
• Equipment and components of coagulation, flocculation and sedimentation processes are identified and applied in terms of their functions.
• Equipment and components of a sludge system are identified and applied in terms of their functions.
• Components and types of pumps are identified and applied in terms of their functions.
Equipment and component of a chemical dosing system are identified and explained in terms of their functions.

Associated Assessment Criteria for Exit level 4:

• Verbal and non-verbal communications skills are used to brief incoming team member(s) on the operation of the water and wastewater treatment plant.
• Shift-take over and handover rules and procedures are adhered to when communicating with team workers.
• Reports are compiled in accordance with work policies and procedures for record keeping purposes.

Integrated Assessment:

Integrated assessment at the level of the qualification provides an opportunity for learners to show that they are able to integrate concepts, ideas and actions across unit standards to achieve competence that is grounded and coherent in relation to the purpose of the qualification. Integrated assessment should show how already demonstrated competence in individual areas can be linked and applied for the achievement of a holistic outcome.

Integrated assessment must judge the quality of the observable performance, and also the quality of the thinking that lies behind it. Assessment tools must encourage learners to give an account of the thinking and decision-making that underpin their demonstrated performance. Some assessment practices will demand practical evidence while others may be more theoretical, depending on the type of outcomes to be assessed, and the nature and level of the qualification. The ratio between action and interpretation is not fixed, but varies according to the demands of the qualification.

While the generic component (literacy, communication and life skills) of this qualification at NQF Level 2 can be assessed through occupational contexts and activities relating to water purification treatment, care must be taken in both the learning programme and the assessment to ensure that these foundational skills are truly portable. The primary aim of this qualification is to ensure that learners have a sound base of general education to prepare them for further learning, whatever career path they may choose. Learners must be able to transfer generic skills such as language, computation and learning skills etc across a number of different contexts, and apply them within a number of learning areas.

A broad range of task-orientated and theoretical assessment tools may be used, with the distinction between practical knowledge and disciplinary knowledge maintained so that each takes its rightful place. Unit standards in the qualification must be used to assess specific and critical cross-field outcomes. During integrated assessments the assessor should make use of formative and summative assessment methods and should assess combinations of practical, applied, foundational and reflexive competencies:

INTERNATIONAL COMPARABILITY

International qualifications were examined to ensure that the qualification model and associated unit standards proposed are comparable in terms of qualification levels, scope and competencies covered. However, the core and elective components have been developed and/or revised taking into account South Africa's unique context, but also looking at international best practice.

Qualifications form the following countries were examined:

Australian Qualifications Framework (AQF):

- NWP01 Water Industry and the Certificate Course in Water and Wastewater.

Scottish Vocational Qualifications (SQA):

- Monitoring the Water Environment level 2, Code G322.
- Operating Process Plant: Sludge level 2, Code G31M.
- Operating Process Plant: Sludge level 2, Code G5HC.
- Operating Process Plant: Water level 2, Code G31J.
- Operating Process Plant: Water level 2, Code G5HE.

New Zealand Qualifications Authority (NZQA):

- National Certificate in Water Treatment (Site Operator).
- National Certificate in Wastewater Treatment (Site Operator), NQF Ref 0879.

United Kingdom (QCA):

- City & Guilds Level 2 Certificate in Water Engineering, *500/1698/2.*
- Certificate in Process Plant Operations Level 2.

Findings concerning comparability:

A substantial degree of similarity was found in most of the qualifications examined. Although the South African qualification combines both water and wastewater process operations due to the similarities found in the core components of both qualifications, the revised qualification provides a mix of mandatory unit standards to cover both water and wastewater core competencies and electives as optional units that enable learners to choose from to address their particular roles in their respective areas of specialization.

The South African qualification and its associated unit standards is generally comparable to the Scottish, Australian, New Zealand in terms of levels, scope and range of competencies covered and slightly with the United Kingdom qualification as well although the titles ofttie qualifications differ.

ARTICULATION OPTIONS
Vertical articulation is possible with:

- National Certicate: Water and Wastewater Treatment Process Operations at NQF Level 3.

Horizontally articulation is possible with:

- National Certificate: Pollution at NQF Level 2.

MODERA nON OPTIONS
- Anyone assessing a learner against these standards must be registered as an assessor with the relevant ETQA.

- Any institution offering learning that will enable achievement of these unit standards or will assess these unit standards must be accredited as a provider with the relevant ETQA.

- Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

- Therefore anyone wishing to be assessed against this qualification may apply to be assessed by any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS
For an applicant to register as an assessor, the applicant needs:

- The assessor must have a qualification at or above the level of this qualification plus a minimum of two years practical, relevant occupational experience.
- Competency in all the outcomes of the generic assessor standard.
- Detailed documentary proof of educational qualification, practical training undergone, and experience gained by the applicant must be provided (Portfolio of evidence).
- To demonstrate competence in relation to these specified standards and qualifications, at or above, the level of the qualifications in question.
- To meet any other additional requirements laid down by their constituent ETQA.

• The subject matter experience of the assessor can be established by recognition of prior learning.
• The status of registered assessors can be checked on the appropriate ETQA database or website.

NOTES
This qualification replaces two qualifications:

• **ID** 24193, National Certificate: Water Purification Process Operations, Level 2, 120 credits.
• **ID** 22673, National Certificate: Wastewater Process Operations. Level 2, 120 Credits.

UNIT STANDARDS

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	246472	Handle and disoose of water and wastewater sludoe	Level 1	5
Core	246443	Ooerate a sand filter	Level 1	4
Core	246459	Aoolv oersonal safetv oractices in the water sector	Level 2	4
Core	246464	Conduct sampling for water and wastewater treatment processes	Level 2	4
Core	246461	Conduct water treatment process control tests	Level 2	4
Core	8494	Demonstrate an understanding of HIV/AIDS and its imolications	Level 2	4
Core	246471	Demonstrate knowledge and understanding of plant eauioment	Level 2	6
Core	246473	Demonstrate knowledge of elementary biology in the water wastewater environment	Level 2	3
Core	246463	Demonstrate knowledge of water cycle. water and wastewater svsterns and processes	Level 2	5
Core	246442	Ooerate oumos	Level 2	5
Core	246535	Operate the chlorine dosina process	Level 2	5
Core	246466	Operate water and wastewater chemical dosaoe svstems	Level 2	10
Core	246449	Orientate self in the workplace	Level 2	6
Elective	246441	Maintain maturation and oxidation ponds	Level 1	2
Elective	116932	Operate a personal computer system	Level 1	3
Elective	246460	Demonstrate basic knowledge of the wastewater treatment process	Level 2	8
Elective	246450	Demonstrate knowledoe of the water treatment process	Level 2	8
Elective	246445	Operate a blolooical trickhno filter	Level 2	4
Elective	246440	Operate coagulation, flocculation and sedimentation processes	Level 2	10
Elective	246468	Operate inlet works	Level 2	5
Elective	246469	Operate primary settling processes in wastewater treatment	Level 2	5
Elective	246486	Operate water recoverv unit	Level 2	4
Elective	246448	OperatInc a rotatinQ biolooical contactor unit	Leve/2	3
Elective	116534	Carry out basic first aid treatment in the workolace	Level 3	2
Elective	246437	Demonstrate knowledge of activated sludge processes in wastewater treatment	Level 3	6
Elective	246446	Operate a rapid aravitv filtration process	Level 3	5
Fundamental	119463	Access and use information from texts	Level 2	5
Fundamental	9009	Apply basic knowledge of statistics and probability to influence the use of data and procedures in order to Investioate life related oroblems	Level 2	3
Fundamental	7480	Demonstrate understanding of rational and irrational numbers and number systems	Level 2	3
Fundamental	9008	Identify, describe, compare, classify, explore shape and motion in 2-and 3-dimensional shapes in different contexts	Level 2	3
Fundamental	119455	Respond to selected literary texts	Level 2	5
Fundamental	119460	Use language and communication in occupational leamina crocrammes	Level 2	5
Fundamental	7469	Use mathematics to investigate and monitor the financial aspects of oersonal and communitv life	Level 2	2
Fundamental	9007	Work with a range of patterns and functions and solve problems	Level 2	5

	10	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119456	Write/oresent for a defined context	Level 2	5

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate knowledge of activated sludge processes in wastewater treatment

SAQA USID	*UNIT STANDARD TITLE*		
246437	Demonstrate knOWledge of activated sludge processes in wastewater treatment		
ORIGINATOR		*PROVIDER*	
SGB Water Sector			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	16

SPECIFIC OUTCOME 1
Describe the theory of activated sludge.

SPECIFIC OUTCOME 2
Describe the layout of the plant.

SPECIFIC OUTCOME 3
Make adjustments on the plant.

SPECIFIC OUTCOME 4
Monitor performance of the plant.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operate coagulation, flocculation and sedimentation processes

SAQA USID	*UNIT STANDARD TITLE*		
246440	Operate coaqulation, flocculation and sedimentation processes		
ORIGINATOR		*PROVIDER*	
8GB Water Sector			
FIELD		*SUBFIELD*	
12 · Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	ReQular	Level 2	10

SPECIFIC OUTCOME 1
Obtain chemical solutions for jar testing.

SPECIFIC OUTCOME 2
Evaluate the flash mixing and coagulation process.

SPECIFIC OUTCOME 3
Monitor the flocculation process.

SPECIFIC OUTCOME 4
Operate the sedimentation process.

SPECIFIC OUTCOME 5
Operate sludge withdrawal process.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Maintain maturation and oxidation ponds

SAQA USID	***UNIT STANDARD TITLE***		
246441	Maintain maturation and oxidation ponds		
ORIGINATOR		***PROVIDER***	
SGB Water Sector			
FIELD		***SUBFIELD***	
12 - Physical Plannina and Construction		Civil Engineering Construction	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 1	12

SPECIFIC OUTCOME 1
Monitor anaerobic ponds.

SPECIFIC OUTCOME 2
Describe the differences between oxidation and maturation ponds.

SPECIFIC OUTCOME 3
Maintain inlets and outlets in accordance with work policies and procedures.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operate pumps

SAQA USID	***UNIT STANDARD TITLE***		
246442	Operate pumps		
ORIGINATOR		***PROVIDER***	
SGB Water Sector			
FIELD		***SUBFIELD***	
12 - Phvsical Plannino and Construction		Civil Engineering Construction	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 2	15

SPECIFIC OUTCOME 1
Explain working principles of pumps.

SPECIFIC OUTCOME 2
Demonstrate knowledge of a pumping system.

SPECIFIC OUTCOME 3
Maintain pumps.

SPECIFIC OUTCOME 4
Maintain drive units of pumps.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operate a sand filter

SAQA USID	***UNIT STANDARD TITLE***		
246443	Operate a sand filter		
ORIGINATOR		***PROVIDER***	
SGB Water Sector			
FIELD		***SUBFIELD***	
12 - Physical Plarmtnq and Construction		Civil Enoineerinq Construction	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 1	14

SPECIFIC OUTCOME 1
Explain the filtration process.

SPECIFIC OUTCOME 2
Control water flow.

SPECIFIC OUTCOME 3
Explain the different types of filters.

SPECIFIC OUTCOME 4
Monitor filter performance.

SPECIFIC OUTCOME 5
Perform backwashing process of a rapid gravity sand filter.

SPECIFIC OUTCOME 6
Explain the unclogging of a slow sand filter.

SPECIFIC OUTCOME 7
Maintain a sand filter.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operate a biological trickling filter

SAQA USID	*UNIT STANDARD TITLE*		
246445	Operate a bioloqical trickling filter		
ORIGINATOR		*PROVIDER*	
SGB Water Sector			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	14

SPECIFIC OUTCOME 1
Explain the operation of a biological trickling filter process.

SPECIFIC OUTCOME 2
Monitor and control a biological trickling filter.

SPECIFIC OUTCOME 3
Apply methods to maintain a biological trickling filter.

SPECIFIC OUTCOME 4
Collate data for biological trickling filters.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operate a rapid gravity filtration process

SAQA USID	*UNIT STANDARD TITLE*		
246446	Operate a rapid gravity filtration process		
ORIGINATOR		*PROVIDER*	
SGB Water Sector			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	15

SPECIFIC OUTCOME 1
Identify and explain the principles of rapid gravity filtration.

SPECIFIC OUTCOME 2
Maintain the filter media.

SPECIFIC OUTCOME 3
Maintain the filter structure.

SPECIFIC OUTCOME 4
Conduct an inspection of compressors, blowers and backwash pumps and compare with design parameters.

SPECIFIC OUTCOME 5
Read and interpret flow indicators.

SPECIFIC OUTCOME 6
Collate data for filtration process.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operating a rotating biological contactor unit

SAQA USID	***UNIT STANDARD TITLE***		
246448	Operating a rotating biological contactor unit		
ORIGINATOR		***PROVIDER***	
SGB Water Sector			
FIELD		***SUBFIELD***	
12 - Phvsical Plannina and Construction		Civil Enaineerina Construction	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 2	13

SPECIFIC OUTCOME 1
Explain the operation of a rotating biological contactor process.

SPECIFIC OUTCOME 2
Monitor and control a rotating biological contactor.

SPECIFIC OUTCOME 3
Apply methods to maintain a rotating biological contactor.

SPECIFIC OUTCOME 4
Collate data for rotating biological contactors.

,SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Orientate self in the workplace

SAQA USID	***UNIT STANDARD TITLE***		
246449	Orientate self in the workplace		
ORIGINATOR		***PROVIDER***	
SGB Water Sector			
FIELD		***SUBFIELD***	
12 - Phvsical Plannina and Construction		Civil Enaineerina Construction	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 2	16

SPECIFIC OUTCOME 1
Explain reporting procedures at own works.

SPECIFIC OUTCOME 2
Explain organisational structure relating to own position.

SPECIFIC OUTCOME 3
Explain security procedures.

SPECIFIC OUTCOME 4
Draw a layout of own works.

SPECIFIC OUTCOME 5
Explain work policies and procedures relating to own job.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UN/T STANDARD:

Demonstrate know/edge of the water treatment process

SAQA US/D	***UN/T STANDARD TITLE***		
246450	Demonstrate knowledge of the water treatment process		
OR/G/NATOR		***PROV/DER***	
SGB Water Sector			
F/ELD		***SUBFIELD***	
12 - Physical Plannina and Construction		Civil Enaineerina Construction	
ABETBAND	***UN/T STANDARD TYPE***	***NQFLEVEL***	***CRED/TS***
Undefined	Regular	Level 2	18

SPECIFIC OUTCOME 1
Explain the water treatment process.

SPECIFIC OUTCOME 2
Explain turbidity and the removal of suspended particles from water.

SPECIFIC OUTCOME 3
Explain acidity and alkalinity.

SPECIFIC OUTCOME 4
Explain the disinfection process.

SPECIFIC OUTCOME 5
Explain and interpret the distribution network.

SPECIFIC OUTCOME 6
Explain sludge handling process.

SPECIFIC OUTCOME 7
Demonstrate knowledge of water treatment monitoring process.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply personal safety practices in the water sector

SAQA USID	*UNIT STANDARD TITLE*		
246459	Apply personal safety practices in the water sector		
ORIGINATOR		*PROVIDER*	
5GB Water Sector			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	14

SPECIFIC OUTCOME 1
Demonstrate knowledge of personal safety practices at the workplace.

SPECIFIC OUTCOME 2
Identify and explain the roles and responsibilities of a health and safety representative.

SPECIFIC OUTCOME 3
Explain the health and safety procedures relating to own job.

SPECIFIC OUTCOME 4
Apply emergency procedures in own work situation.

SPECIFIC OUTCOME 5
Maintain good housekeeping practices in a working environment.

SPECIFIC OUTCOME 6
Identify and explain occupational health and safety hazards in the water sector.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate basic knowledge of the wastewater treatment process

SAQA USID	***UNIT STANDARD TITLE***		
246460	Demonstrate basic knowledge of the wastewater treatment process		
ORIGINATOR		***PROVIDER***	
SGB Water Sector			
FIELD		***SUBFIELD***	
12 - Phvsical Plannino and Construction		Civil Enaineerina Construction	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 2	18

SPECIFIC OUTCOME 1
Explain *the* properties of water and water contaminants.

SPECIFIC OUTCOME 2
Explain different sources of wastewater.

SPECIFIC OUTCOME 3
Identify and describe the steps of the wastewater treatment process.

SPECIFIC OUTCOME 4
Explain different types of sanitation systems.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Conduct water treatment process control tests

SAQA US ID	***UNIT STANDARD TITLE***		
246461	Conduct water treatment process control tests		
ORIGINATOR		***PROVIDER***	
SGB Water Sector			
FIELD		***SUBFIELD***	
12 - Physical Plannino and Construction		Civil Enoineerino Construction	
ABET BAND	*UNIT STANDARD* ***TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 2	14

SPECIFIC OUTCOME 1
Calibrate test instruments.

SPECIFIC OUTCOME 2
Perform physical determinant tests.

SPECIFIC OUTCOME 3
Perform chemical determinant tests.

SPECIFIC OUTCOME 4
Conduct settling tests.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate knowledge of water cycle, water and wastewater systems and processes

SAQA USID	*UNIT STANDARD TITLE*		
246463	Demonstrate knowledge of water cycle, water and wastewater systems and processes		
ORIGINATOR		*PROVIDER*	
SGB Water Sector			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Recular	Level 2	15

SPECIFIC OUTCOME 1
Identify and explain the process of the natural water cycle.

SPECIFIC OUTCOME 2
Explain the impact of land-use on water within a catchment.

SPECIFIC OUTCOME 3
Discuss ground water as a water resource.

SPECIFIC OUTCOME 4
Discuss surface water as a water resource.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Conduct sampling for water and wastewater treatment processes

SAQA USID	*UNIT STANDARD TITLE*		
246464	Conduct samolinc for water and wastewater treatment processes		
ORIGINATOR		*PROVIDER*	
SGB Water Sector			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Regular	Level 2	14

SPECIFIC OUTCOME 1
Identify and describe sampling points.

SPECIFIC OUTCOME 2
Prepare for sampling.

SPECIFIC OUTCOME 3
Perform chemical sampling.

SPECIFIC OUTCOME 4
Perform microbiological sampling.

SPECIFIC OUTCOME 5
Carry out associated field tests.

SPECIFIC OUTCOME 6
Explain the collection of samples from auto-samplers.

SPECIFIC OUTCOME 7
Prepare for hand over of samples.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operate water and wastewater chemical dosage systems

SAQA USID	***UNIT STANDARD TITLE***		
246466	Operate water and wastewater chemical dosage systems		
ORIGINATOR		***PROVIDER***	
5GB Water Sector			
FIELD		***SUBFIELD***	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 2	10

SPECIFIC OUTCOME 1
Identify the chemicals used on a water and wastewater treatment plant.

SPECIFIC OUTCOME 2
Prepare chemical concentration and adjust chemical dosing rate.

SPECIFIC OUTCOME 3
Maintain chemical dosing facilities and equipment in a safe working condition.

SPECIFIC OUTCOME 4
Demonstrate knowledge of emergency procedures in emergency situations.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operate inlet works

SAQA USID	*UNIT STANDARD TITLE*		
246468	Operate inlet works		
ORIGINATOR		*PROVIDER*	
SGB Water Sector			
FIELD		*SUBFIELD*	
12 - Phvsical Plannina and Construction		Civil Enaineerina Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQFLEVEL*	*CREDITS*
Undefined	Regular	Level 2	15

SPECIFIC OUTCOME 1
Plan work according to inlet flow and the occurrence of rain and pollution.

SPECIFIC OUTCOME 2
Remove and dispose screenings.

SPECIFIC OUTCOME 3
Explain the reasons for use of storm water and bypass weirs.

SPECIFIC OUTCOME 4
Dispose of grit from inlet works.

SPECIFIC OUTCOME 5
Record flow measurement in inlet works.

SPECIFIC OUTCOME 6
Identify and report equipment and structural defects.

SPECIFIC OUTCOME 7
Monitor influent to detect pollution.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operate primary settling processes in wastewater treatment

SAQA USID	***UNIT STANDARD TITLE***		
246469	Operate primary settlina processes in wastewater treatment		
ORIGINATOR		***PROVIDER***	
SGB Water Sector			
FIELD		***SUBFIELD***	
12 - Phvsical Planning and Construction		Civil Engineering Construction	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reaular	Level 2	15

SPECIFIC OUTCOME 1
Demonstrate knowledge of the different settling processes.

SPECIFIC OUTCOME 2
Disludge and de-scum in accordance with working procedures.

SPECIFIC OUTCOME 3
Maintain settling tanks.

SPECIFIC OUTCOME 4
Collate data for settling tanks.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate knowledge and understanding of plant equipment

SAQA USID	***UNIT STANDARD TITLE***		
246471	Demonstrate knowledoe and understandino of elant eculoment		
ORIGINATOR		***PROVIDER***	
SGB Water Sector			
FIELD		***SUBFIELD***	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Reoular	Level 2	16

SPECIFIC OUTCOME 1
Identify and describe the different plant equipment on water and wastewater environment.

SPECIFIC OUTCOME 2
Apply safety procedures during the operation of plant equipment.

SPECIFIC OUTCOME 3
Demonstrate knowledge of plant instrumentation.

SPE.CIFIC OUTCOME 4
Maintainplanl instrumentation.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Handle and dispose of water and wastewater sludge

SAQA USID	***UNIT STANDARD TITLE***		
246472	Handle and disoose of water and wastewater sludae		
ORIGINATOR		***PROVIDER***	
SGB Water Sector			
FIELD		***SUBFIELD***	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Reaular	Level 1	15

SPECIFIC OUTCOME 1
Explain health and environmental risks when handling and disposing of water and wastewater sludge.

SPECIFIC OUTCOME 2
Identify and describe the disposal options for water and wastewater sludges.

SPECIFIC OUTCOME 3
Record the volume of water and wastewater sludge disposal.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate knowledge of elementary biology in the water wastewater environment

SAQA US ID	*UNIT STANDARD TITLE*		
246473	Demonstrate knowledge of elementary biology in the water wastewater environment		
ORIGINATOR		*PROVIDER*	
SGB Water Sector			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	13

SPECIFIC OUTCOME 1
Identify and describe the classification of different living organisms.

SPECIFIC OUTCOME 2
Identify and explain micro and macro organisms.

SPECIFIC OUTCOME 3
Demonstrate knowledge of the importance of bacteria in water and wastewater environment.

SPECIFIC OUTCOME 4
Demonstrate knowledge of the potential dangers of viruses in the wastewater environment.

SPECIFIC OUTCOME 5
Explain the significance of aquatic plants in water and wastewater process.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operate water recovery unit

SAQA *USID*	***UNIT STANDARD TITLE***		
246486	Operate water recovery unit		
ORIGINATOR		***PROVIDER***	
5GB Water Sector			
FIELD		***SUBFIELD***	
12 - Physical Planning and Construction		Civil Engineerina Construction	
ABETBAND	***UNIT STANDARD TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	Regular	Level 2	14

SPECIFIC OUTCOME 1
Identify and explain the principles of water recovery unit.

SPECIFIC OUTCOME 2
Demonstrate knowledge and ability to use operating instructions.

SPECIFIC OUTCOME 3
Perform calculations relevant to recovery unit.

SPECIFIC OUTCOME 4
Maintain a recovery unit.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operate the chlorine dosing process

SAQA USID	***UNIT STANDARD TITLE***		
246535	Ooerate the chlorine dosing process		
ORIGINATOR		***PROVIDER***	
SGB Water Sector			
FIELD		***SUBFIELD***	
12 - Phvsical Plannina and Construction		Civil Enqineerino Construction	
ABET BAND	*UNIT STANDARD* ***TYPE***	***NQFLEVEL***	***CREDITS***
Undefined	1 Regular	Level 2	15

SPECIFIC OUTCOME 1
Demonstrate knowledge of the dangers of chlorine gas and chlorine compounds.

SPECIFIC OUTCOME 2
Apply safety procedures in handling chlorine and products.

SPECIFIC OUTCOME 3
Identify and describe a layout plan of the chlorine dosing installation.

SPECIFIC OUTCOME 4
Operate chlorine dosing equipment.

SPECIFIC OUTCOME 5
Measure the effectiveness of chlorine dosing.

SPECIFIC OUTCOME 6
Measure chlorine residual.